Business & Enterprise Systems

Integrity - Service - Excellence

Project Management Training

Draft: 26 February 2015

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Expectations

- **This course is designed to introduce how Program and Project Managers conduct business under the BES Process Directory (BPD)**

- **This course will not teach you everything you need to know to be an effective Program/Project Manager**

- **This course does not replace structured DAU course studies in the Program Management or Systems Engineering disciplines**

Training Objectives

- **Define Program and Project Management**
- **Review Key Elements of the BES Process Directory (BPD)**
- **Describe Key Project Management Functions**
- **Describe Common Post Implementation Actions**

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Introductions

- **Please tell the class about yourself…**
  - **Name**
    - **Program or Project Assignment?**
    - **Assigned Role?**
    - **What do you hope to learn from this class?**

What is a Program?

- **Program Defined:**

A group of related projects (more than one) managed in a coordinated way to obtain benefits and control not available from managing them individually. The intent is to improve organizational performance.

Program Management is the application of knowledge, skills and techniques to manage a group of related projects effectively and efficiently. It typically involves the need to identify and manage cross-project dependencies like risks, issues, requirements, design, integration, implementation, and/or customer support.

What is a Project?

- **Project Defined:**

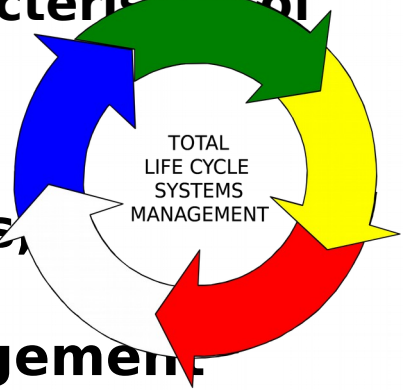
A project is a temporary group activity designed to produce a unique product, service or result. A project is temporary in that it has a defined beginning and end in time, and therefore defined scope and resources. For example, the development of software releases are projects, not programs. Each must be expertly managed to deliver the right functionality (performance), on-time, and within budget.

Project Management is the application of knowledge, skills and techniques to execute projects effectively and efficiently.

In the BPD, we tend to use Project Management (Manager) and Program Management (Manager) interchangeably – but they are *different*. This training will focus on PROJECT Management.

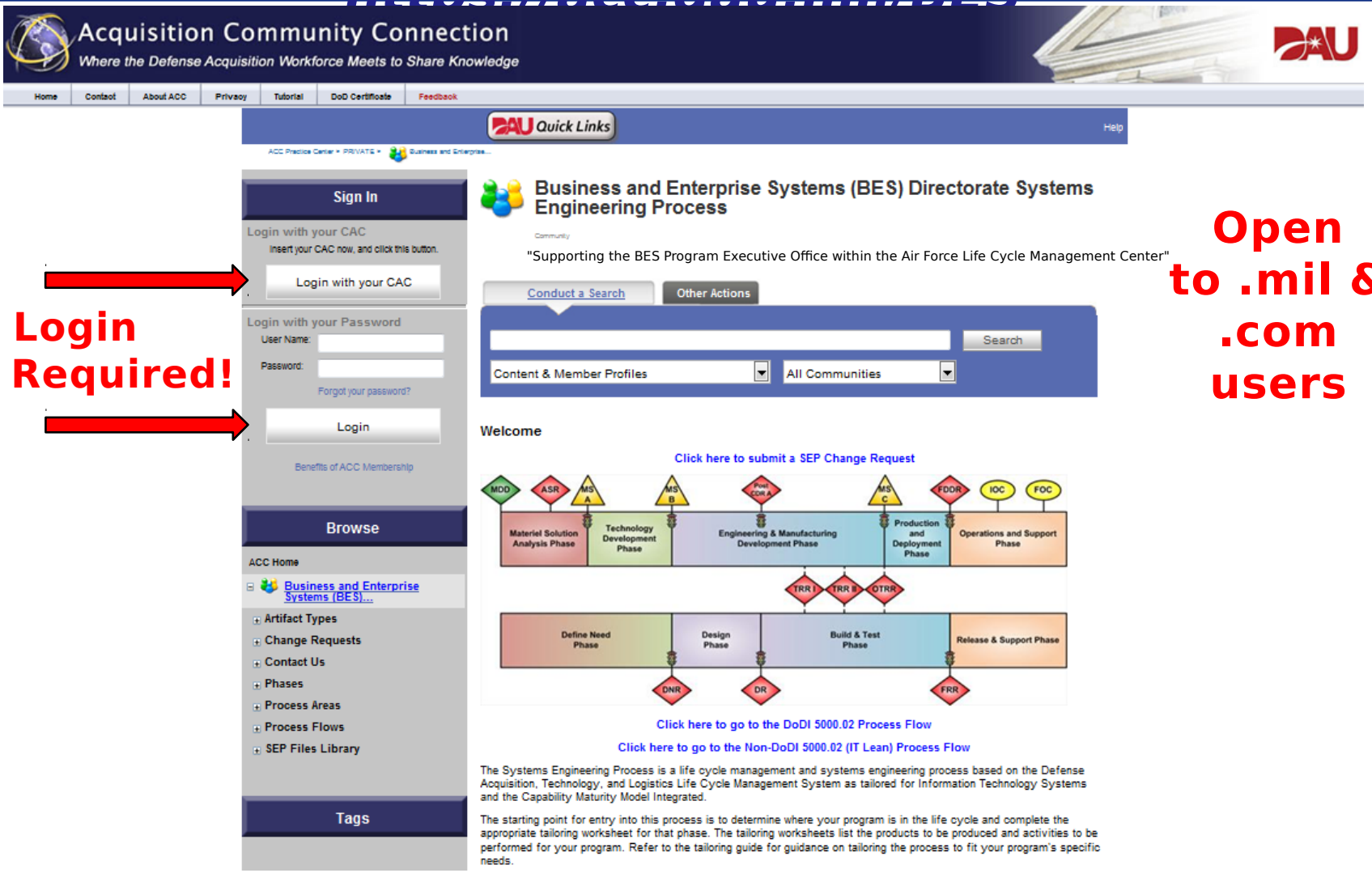
What is the BPD?

- **Role-based technical and managerial frameworks for applying methods, tools, and people to the acquisition, development, and sustainment of information technology programs/projects**
  - **Step-by-step procedural guidance at the global, phase, and work product levels; includes comprehensive entry and exit criteria**
  - **Built-in systems engineering to reduce risk and avoid potential programmatic shortfalls**
  - ***Tailorable* to accommodate the unique characteristics of individual programs**
- **A resource that provides guides, forms, templates, procedures, reference materials, and checklists to assist program teams in every step of acquisition lifecycle management**



Where is the BPD?

https://acc.dau.mil/BES


Acquisition Community Connection
Where the Defense Acquisition Workforce Meets to Share Knowledge
Home
Contact
About ACC
Privacy
Tutorial
DoD Certificate
Feedback
DAU Quick Links
Help
Sign In
Login with your CAC
Insert your CAC now, and click this button.
Login with your CAC
Login with your Password
User Name:
Password:
Forgot your password?
Login
Benefits of ACC Membership
Browse
ACC Home
Business and Enterprise Systems (BES)...
Artifact Types
Change Requests
Contact Us
Phases
Process Areas
Process Flows
SEP Files Library
Tags
Business and Enterprise Systems (BES) Directorate Systems Engineering Process
"Supporting the BES Program Executive Office within the Air Force Life Cycle Management Center"
Conduct a Search
Other Actions
Search
Content & Member Profiles
All Communities
Welcome
Click here to submit a SEP Change Request
MDD
ASR
MS A
MS B
Post CDR A
MS C
FDDR
IOC
FOC
Materiel Solution Analysis Phase
Technology Development Phase
Engineering & Manufacturing Development Phase
Production and Deployment Phase
Operations and Support Phase
TRR I
TRR II
OTRR
Define Need Phase
Design Phase
Build & Test Phase
Release & Support Phase
DNR
DR
FRR
Click here to go to the DoDI 5000.02 Process Flow
Click here to go to the Non-DoDI 5000.02 (IT Lean) Process Flow
The Systems Engineering Process is a life cycle management and systems engineering process based on the Defense Acquisition, Technology, and Logistics Life Cycle Management System as tailored for Information Technology Systems and the Capability Maturity Model Integrated.
The starting point for entry into this process is to determine where your program is in the life cycle and complete the appropriate tailoring worksheet for that phase. The tailoring worksheets list the products to be produced and activities to be performed for your program. Refer to the tailoring guide for guidance on tailoring the process to fit your program's specific needs.

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BPD Foundation

- DOD, AF, MAJCOM and other HHQ publications
  - DODI 5000.02
  - AFI 63-1201 and Supplements, 63-101/20-101 and Supplements
  - Defense Acquisition Guidebook
  - Process area AFIs and T.O.s (PM, T&E, ORM, Requirements, etc.)
- Business Capability Lifecycle (BCL) Interim Guidance Memo
- Public Law (e.g., NDAA, Clinger-Cohen Act)
- IEEE and Military Standards
- SEI's Capability Maturity Model Integration® (CMMI®)
- Best Commercial Practices
- Lessons Learned

Capability Maturity Model Integration® (CMMI®)

- Product of the Software Engineering Institute (SEI)
  - A Federally Funded Research and Development Center (FFRDC)
- CMMI® is based on:
  - Documented, repeatable processes
  - Process measurements which assist in decision-making
  - Disciplined organizational behaviors
- CMMI® is focused on:
  - Systems/Software Engineering
  - Repeatable, measurable processes
  - Integrated Product and Process Development
  - Supplier Sourcing

CMMI® Substance

- Levels of capability maturity coincide with levels of process definition, measurement, and decision-making criteria
- Focuses on elements of essential best practices and processes from various bodies of knowledge
- Not a radical new approach—they describe common sense, efficient, proven ways of doing business
- Presents a minimum set of recommended practices and leverage points proven to enhance organizational maturity and project capability
  - Defines the expectation ("what")…
  - …without overly constraining implementation ("how")

BPD Roles

- Each member of your team should have at least one BPD role
- BPD refers to specific roles when describing who implements procedures and steps
- Specific training is suggested for each role
  - Use ETMS to record training requirements (may also use Individual Development Plan (IDPs))
- Each role has associated responsibilities documented in all BPD procedures
- Roles include Program Manager, Configuration Manager, Requirements Manager, Functional Analyst, Developer, Lead Engineer etc.

BPD Reference: **BPD Roles and Project Organization Guide (SWGD035)**

Process Discussion

- What is a process?
  - … a series of actions or operations leading to a particular end
- Why do we need a process for software acquisition and program management?
  - It is estimated that approximately 20% of projects are completed on time/within budget – with the “right” functionality
- Why does it seem so difficult for our organization to employ a process?
  - Needless activity; no value?
  - Costs too much?
  - Takes too much time?
  - Lack of understanding?

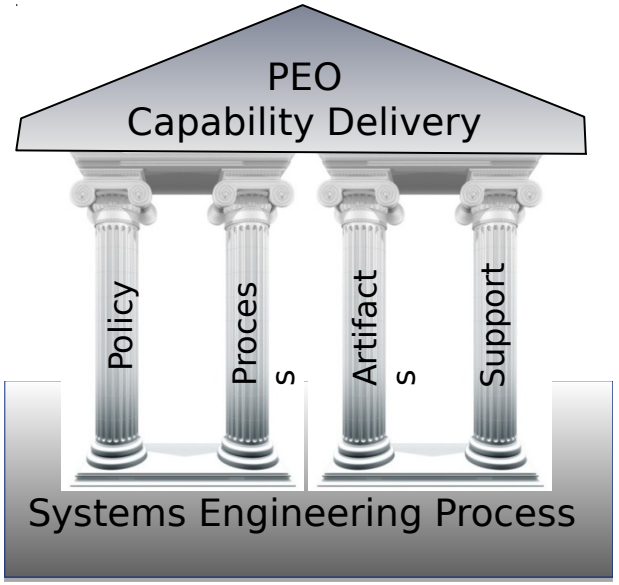
Benefits of a Standardized Process

- **Provides project teams a structured process that supports delivery of mission-ready and sustainable products**
  - **Assists in satisfying customer and user requirements**
  - **Delivers repeatable processes**
  - **Provides the structure and rigor to satisfy AF SEAM requirements**
- **Helps reduce program/project risk**
- **Guides teams through DoD, AF, AFMC, Center and statutory directives, instructions and life cycle policies; centralized location for current policy, guidance, and governance**
- **Ensures verification and validation of product(s); higher quality project documentation/artifacts – better deliverables**
- **Provide a mechanism to capture organizational**

BPD Process Areas
(Global Disciplines)

BPD Process Areas
(Global Disciplines)

- **Performed regularly throughout the lifecycle of the program –event driven, not schedule driven**
  - **Configuration Management**
  - **Decision Analysis and Resolution**
  - **Measurement and Analysis**
  - **Organizational Process Definition**
  - **Process/Product Quality Assurance**
  - **Project Monitoring and Control**
  - **Requirements Development**
  - **Requirements Management**
  - **Risk Management**
  - **Supplier Agreement Management**
  - **Training**
  - **Verification and Validation**



Configuration Management

- **Purpose: To establish and maintain integrity of work products using configuration identification, configuration control, configuration status accounting, and configuration audits**
- **Goals:**
  - **Establish Baselines**
    - **Identify Configuration Items (CIs)**
    - **Establish CM System**
    - **Create or Release Baselines**
  - **Track and Control Changes**
    - **Track Change Requests and Control CIs**
  - **Establish Integrity**
    - **Establish CM Records**
    - **Perform Configuration Audits**

BPD Configuration Management

BPD Reference: Configuration Management Process Area

Decision Analysis and Resolution

- **Purpose: To analyze possible decisions using a formal process that evaluates identified alternatives against established or derived criteria**
- **Goal:**
  - **Evaluate alternatives**
    - **Establish guidelines for decision analysis**
    - **Establish evaluation criteria**
    - **Identify alternative solutions**
    - **Select evaluation methods**
    - **Eliminate inferior alternatives**
    - **Select solutions**

BPD Reference: Decision Analysis and Resolution Procedure (DAPR001)

Measurement and Analysis

- **Purpose: To develop and sustain a measurement capability that is used to support project and system performance information needs**
- **Goals:**
  - **Align M&A Activities**
    - **Establish Organizational Measurement Objectives**
    - **Specify Measures**
    - **Specify Data Collection and Storage**
    - **Specify Analysis Procedures**
  - **Provide Measurement Results**
    - **Collect Measurement Data**
    - **Analyze Measurement Data**
    - **Store Data and Results**
    - **Communicate Results**

BPD Reference: Measurement and Analysis Procedure (MAPR001)

Organizational Process Definition

- **Purpose: To establish and maintain a usable set of organizational process assets and work environment; primary process area for BPD maintenance**
- **Goal: Establish Organizational Process Assets**
  - **Establish standard processes**
  - **Establish lifecycle model descriptions**
  - **Establish tailoring guidelines**
  - **Establish organization's measurement repository**
  - **Establish organization's process asset library (our BPD)**
  - **Establish work environment standards**

BPD Reference: Organizational Process Definition Process Area

Process & Product Quality Assurance

- **Purpose: To provide staff and management objective insight into processes and associated work products**
- **Goals**
  - **Objectively evaluate:**
    - **Processes for effectiveness and efficiency**
    - **Work products and services to satisfy needs**
  - **Provide objective insight**
    - **Ensure resolution of nonconformance/noncompliance issues**
    - **Establish and maintain records**
      - **Conduct trend analysis**

BPD Reference: Product/Process Quality Assurance Process Area

Project Monitoring and Control

- **Purpose: To provide an understanding of program's progress so appropriate corrective actions can be taken when performance deviates significantly from the plan**
- **Goals**
  - **Monitor project against plan**
    - **Monitor project planning parameters**
    - **Monitor commitments**
    - **Monitor project risks**
    - **Monitor data management**
    - **Monitor stakeholder involvement**
    - **Conduct progress, technical and milestone reviews**
  - **Manage corrective actions to closure**
    - **Analyze issues**
    - **Apply appropriate corrective actions**
    - **Manage results of corrective actions**

BPD Reference: Project Monitoring and Control Process Area

Requirements Development

- **Purpose: To produce and verify customer, product and product component requirements**
- **Goals:**
  - **Develop customer requirements**
    - **Elicit needs**
    - **Develop and verify customer requirements**
  - **Develop product requirements**
    - **Determine product and product component requirements**
    - **Allocate product component requirements**
    - **Identify interface requirements**
  - **Analyze and validate requirements**
    - **Establish operational concepts and scenarios**
    - **Establish a definition of required functionality**
    - **Analyze requirements**
    - **Validate requirements**

BPD Requirements Development & Management

BPD Reference: Requirements Development Process Area

Requirements Management

- **Purpose: To manage the requirements of the project's products and product components and identify inconsistencies between those requirements and the project's plans and work products**
- **Goal: Manage requirements**
  - **Obtain an understanding of requirem**
  - **Obtain commitment to requirements**
  - **Manage requirement changes**
  - **Maintain bi-directional traceability of requirements**
  - **Identify inconsistencies between project products and requirements**

BPD Requirements Development & Management

BPD Reference: Requirements Management Process Area

Risk Management

- **Purpose: To identify potential problems before they occur so risk-handling activities may be planned and applied as needed across the life of the product or project to mitigate adverse impacts on achieving objectives**
- **Goals:**
  - **Prepare for risk management**
    - **Determine risk sources**
    - **Define risk parameters**
    - **Establish risk management strategy**
  - **Identify and analyze risks**
    - **Identify risks**
    - **Evaluate, categorize, and prioritize risks**
  - **Mitigate risks**
    - **Develop risk mitigation plans**
    - **Implement risk mitigation plans**

BPD Reference: Risk Management Procedure (RMPR001)

Supplier Agreement Management

- **Purpose: To manage acquisition of products and services from suppliers**
- **Goals:**
  - **Establish supplier agreements**
    - **Determine acquisition types**
    - **Select suppliers**
    - **Establish supplier agreements**
  - **Satisfy supplier agreements**
    - **Execute the supplier agreement**
    - **Monitor selected supplier processes**
    - **Evaluate selected supplier work products and services**
    - **Accept the acquired products and services**

BPD Reference: Supplier Agreement Management Process Area

Training

- **Purpose: To develop people's skills and knowledge so they can perform their roles effectively and efficiently**
- **Goals:**
  - **Establish organizational training capability based on needs**
    - **Determine strategic training needs; define which are the responsibility of organization and which are project-specific**
    - **Establish an organizational training plan**
  - **Establish project training requirements**
    - **Determine tactical training needs within the project**
  - **Plan and provide necessary training**
    - **Schedule and conduct training**
    - **Assess training effectiveness**
    - **Establish and maintain training records**

BPD Reference – Training Process Area

Verification

- **Purpose: To ensure selected work products meet specified requirements…*"Did we build 'it' right?"***
- **Goals:**
  - **Prepare for verification**
    - **Select work products for verification**
    - **Establish verification environment**
    - **Establish verification procedures and criteria**
  - **Perform peer reviews**
    - **Prepare for peer reviews**
    - **Conduct peer reviews**
    - **Analyze peer review data**
  - **Verify selected work products**
    - **Perform verification**
    - **Analyze verification results**

BPD Integrated Developmental Test & Evaluation

BPD Reference: Verification and Validation Process Area

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Validation

- **Purpose: To demonstrate that a product or product component fulfills its intended use when placed in its intended environment…*"Did we build the 'right' thing?"***
- **Goals:**
  - **Prepare for validation**
    - **Select products for validation**
    - **Establish the validation environment**
    - **Establish validation procedures and criteria**
  - **Validate product or product components**
    - **Perform validation**
    - **Analyze validation results**

BPD Integrated Developmental Test & Evaluation

BPD Reference: Verification and Validation Process Area

Process Areas

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Browse

ACC Home Up one level

- Business and Enterprise Systems (BES)...
  - Artifact Types
  - Change Requests
  - Contact Us
  - Phases
  - Process Areas
    - Configuration Management
    - Decision Analysis and Resolution
    - Measurement and Analysis
    - Organizational Process Definition
    - Process / Product Quality Assurance
    - Project Monitoring and Control
    - Requirements Development
    - Requirements Management
    - Risk Management
    - Supplier Agreement Management
    - Training
    - Verification and Validation
  - Process Flows
  - SEP Files Library

Business and Enterprise Systems (BES) Directorate Systems Engineering Process

Community

"Supporting the BES Program Executive Office within the Air Force Life Cycle Management Center"

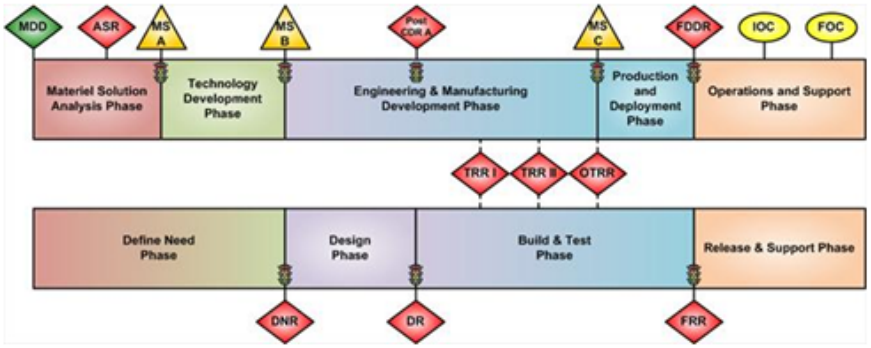
Conduct a Search | Other Actions

Search

Content & Member Profiles | All Communities

Welcome

Click here to submit a SEP Change Request



Click here to go to the DoDI 5000.02 Process Flow

Click here to go to the Non-DoDI 5000.02 (IT Lean) Process Flow

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Project Tailoring & Waivers

Project Tailoring

- All projects have unique characteristics that must be considered
  - One consideration is that all parts of the BPD may not need to be accomplished (or re-accomplished)_
  - Tailoring is process flexibility to address project-unique execution that deviates from the standard process
- Tailoring must be balanced with standards, objectives and strategies of the program and be based on risk to the project
- Lack of resources is NOT authorization for tailoring

BPD Reference: **BPD Tailoring Guide (PDGD007)**

Tailoring Worksheet (TWS) Description

- **Roadmap of required documentation, products and associated processes used to meet capability delivery commitments**
- **<u>Agreement</u> between the PM and LE/CE on processes and artifacts that will be accomplished; BPD IPT coordinates**
  - **Contractors should not sign; elevate to the next level**
- **A TWS is <u>NOT</u> release specific…it is a lifecycle plan that can aid in identifying programmatic and engineering requirements**
- **BPD Tailoring Worksheet determines which framework, processes and products are to be completed by the project**
  - **If a product or activity is tailored out or down, it must be justified and approved**
  - **Tailoring up (in) is authorized and encouraged**

Which TWS Template?

- **5000.02 Framework – ACAT I and Oversight Programs:**
  - **Depends on Acquisition Phase (MDA Direction)**
    - **Materiel Solution Phase: SWTM034**
    - **Technology Development Phase: SWTM039**
    - **Engineering and Manufacturing Development or the Production & Deployment Phase: SWTM040**
    - **Operations and Support: SWTM052**
- **Sustainment (Non-ACAT):**
  - **New Starts: SWTM051**
  - **Operational Systems: SWTM052**

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When is a TWS Required?

- A TWS is required for every project identified on the PPL, unless exempted or granted a waiver
- A new TWS is required every two years and when:
  - A project changes the development or acquisition strategy
  - Policy mandates drive additional products/processes
  - Policy changes reduce products/processes
- Types of tailoring:
  - Altering product content
  - Dividing products/processes into smaller items
  - Changing order, flow, or format of products
  - Eliminating a product/process
  - Adding a new product/process

Tailoring Symbols

- **Symbols used on the TWS:**
  - ✓ **indicates the product/process will be executed as described in the BPD procedures, templates, etc.**
  - * **indicates the product/process is tailored in some fashion; justification is required**
    - **Use the * for added products/processes**
  - **N/A indicates the product/process it tailored OUT and will not be accomplished; justification is required**

Sample TWS Extract

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SWTM052 Tailoring Worksheet for Sustainment Template (Non-5000) 20 September 2012

Row No.	√, * or N/A	Product	References	Justification For Tailoring
47		Interface Control Working Group (ICWG) and Minutes	ICWG Charter Template	
48		Draft Interface Requirements Agreements (IRAs)	IRA Template	
49		Draft General Requirements Specification (GRS)	GRS Template	
50		Draft Concept of Operations (ConOps)	ConOps Template	
51		Draft System Subsystem Specification (SSS)	SSS Template	
52		Draft Software Requirements Specification (SRS)	SRS Template	
53		Updated RTM	RTM Template	
54		Preliminary Design Document (DD)	DD Template	

Tailoring Indicator

Product Hyperlinks

Tailoring (Cont'd)

- **Tailoring that is generally approved:**
  - **Product substitutions (GRS in place of the SSS, SRS and CONOPS) (use *)**
  - **Items required for ACAT I or oversight programs (MAIS) that are not applicable to sustainment systems (use N/A)**
  - **Product formats that differ from BPD templates provided the equivalent meaning/intent of the product is met (use *)**
  - **Products tailored "up" or added (use *)**
  - **Products/processes executed by another agency with responsibility and accountability (use N/A)**
- **Tailoring that is difficult to approve and justify:**
  - **Mandatory reviews (Milestones, Tech Reviews, Phase Reviews, Release Decision Reviews)**
  - **Baselines (FBL, ABL, PBL)**
  - **Products mandated by statute or DoD, USAF, MAJCOM, or Center instruction**
  - **Any product or process not completed that puts a program at greater cost/schedule/performance risk**

SoS / FoS Tailoring Guidance

- **SoS: Group of INTERDEPENDENT systems that are related or connected to provide a capability; the loss of any part of the system will degrade the capability as a whole**
  - **Elevate tailoring to the SoS Program Level**

- **FoS: Group of INDEPENDENT systems that can be arranged or interconnected to provide different capabilities within the same functional thread**
  - **Elevate tailoring to the FoS Program level provided all products and processes are executed the same way**
  - **If any systems in a FoS execute processes a different way, prepare a unique TWS for each program**

Waiver Process

- **A waiver is any deviation from the BPD that the normal tailoring process cannot adequately address**
  - **All waiver requests must be coordinated with the project's chain of command and the BPD IPT**
  - **All waivers are approved by the PEO or Directorate Deputy(s)**
  - **BPD waivers are valid for only one year. If the condition that generated the need for the waiver exists beyond one year, the waiver request must be resubmitted and re-approved.**

BPD Reference: BPD Waiver Procedure (TOPR004)

Project Management Functions

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Project Manager Skills

- **Leading – Creating and maintaining an atmosphere that motivates people to achieve desired results**
- **Planning - Predetermining and timing actions for accomplishing objectives**
- **Organizing - Arranging relationships among work units to accomplish objectives; assigning responsibility, accountability and authority to attain those objectives**
- **Staffing - Selecting and training people to maximize their effectiveness in meeting project objectives**
- **Directing – Assuring people know exactly what they should be doing at any given time**
- **Controlling - Establishing, measuring and evaluating performance of activities toward planned objectives**

The Project Manager's Role

- **Responsibility for the project**
  - **Freedom to make decisions about strategy, approach, or activities needed to accomplish the same results within the same time, cost, and scope**
- **Accountability for project results**
  - **Accountable to the customer and organizational leadership for delivery of the overall results; everything within the scope of the project must be clearly defined and measurable**
- **Authority to execute the project**
  - **Authority to enforce behaviors necessary to attain the results for which they are accountable; authority to adjust the project team to meet objectives**

Key Project Management Functions

- **Project Organization**
  - Integrated Product Teams
  - Project Roles
  - Project Staffing & Training
- **Project Planning & Resource Allocation**
  - Integrated Master Plan (IMP)
  - Work Breakdown Structure (WBS)
  - Integrated Master Schedule (IMS)
  - Refinements & Re-Baselines
- **Requirements Development & Management**
- **Expectation Management**
  - Expectation Management Agreements
  - Statements of Capability
  - Service Level Agreements
- **Project Monitoring & Control**
  - Risk Management
  - Project Reviews
  - Metrics

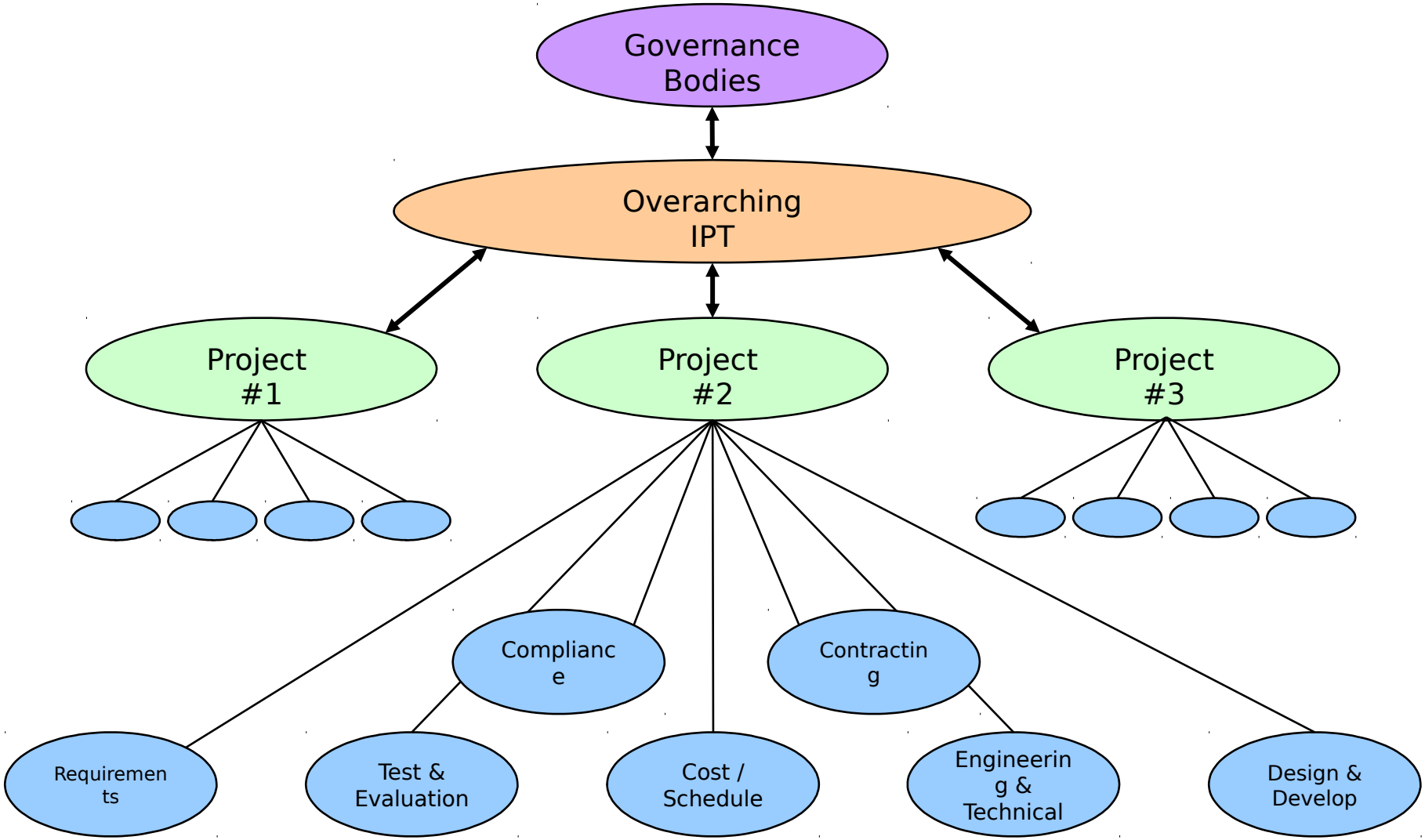
Project Organization

Integrated Product Teams (IPTs)

- **IPTs are <u>empowered</u> multi-disciplinary groups of people who are collectively *responsible for delivering a defined product*; focused on collaboration and communication**
  - **Project Monitoring and Control**
  - **Technical Management**
  - **Innovation**
  - **Problem Solving and Decision Making**

- **There are two types of IPTs:**
  - **Overarching IPT – usually comprised of organization senior leaders provides oversight and direction to working-level IPTs**
  - **Working-Level IPT – usually composed of project team members (including contractors)**

Example IPT Composition



IPTs (Cont'd)

- **IPTs are managed via a formal charter with <u>defined roles and responsibilities</u>**
  - **Recommendation: Align the IPT to BPD roles and natural teams**

- **"Administrivia"**
  - **IPTs must meet regularly to be effective**
  - **Document IPT meetings; capture action items and track**
  - **Capture significant decision**
  - **Empower members and hold them accountable**

Project Roles

- The BPD refers to roles when describing who implements procedures and steps; roles may be performed by government or contractor personnel
- Specific training is suggested for each role
  - Use ETMS to record in IDP (Individual Development Plan)
- Roles include (not all inclusive):

Project Manager	Lead Programmer
Chief / Lead Engineer	Developer
Configuration Manager	Test Manager
Requirements Manager	Contracting Officer
Functional Analyst / SMEs	Information Assurance Manager
Architect	Systems Administrator
Lead Designer	Database Administrator

BPD Reference: **BPD Roles and Project Organization Guide (SWGD035)**

Staffing a Project

- **Use the project WBS to determine skills required and estimate level of effort**
  - **Pay particular attention to those skills that require advanced certifications (e.g., SAs, DBAs, IAMs/IAOs, etc.)**
- **Build staffing plan based on when resources are needed**
  - **Identify those duties that must be performed by government personnel**
  - **Identify those duties that can be performed by anyone with the proper skills**
  - **Determine availability of organic personnel and contractor funding**
  - **Consider training required by function/role**

Staffing a Project (Cont'd)

- **Acquire government and contractor skill as necessary**
  - **Consider depth & breadth of knowledge/experience**
  - **Breadth of experience across unrelated projects**
  - **Consider academic achievements and specific training**
- **Allocate resources to the project schedule**
  - **Balance resources against commitments and risks**
  - **Adjust dependencies and task durations to accommodate resource limitations**
  - **Identify schedule task gaps and take action to "cover" the tasks**
- **Monitor execution; adjust as necessary**

Project Planning & Resource Allocation

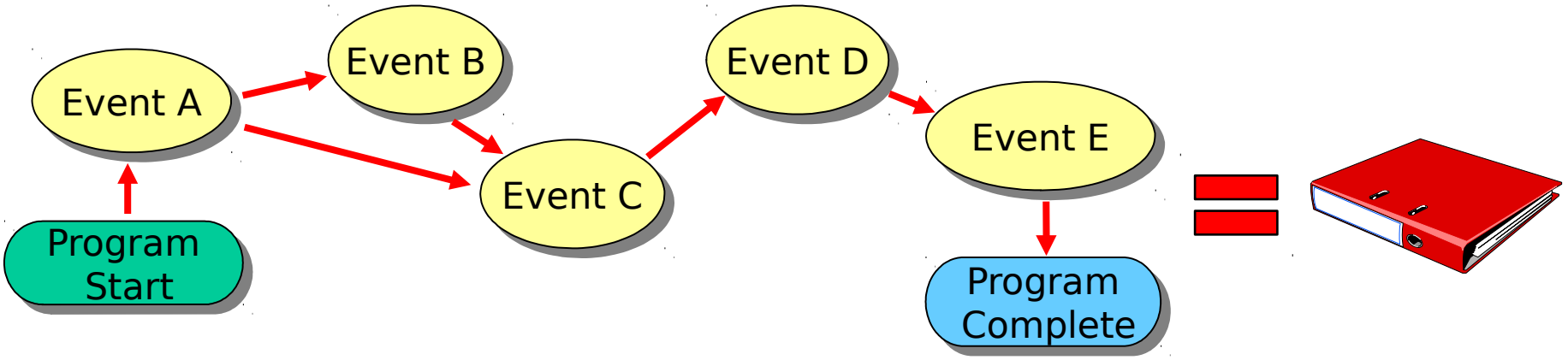
Project Planning

- **Purpose: To establish and maintain plans defining project activities**
  - **Establish Estimates**
    - **Estimate scope of project, including total lifecycle scope**
    - **Establish estimates for work products and tasks**
    - **Determine cost / effort estimates**
  - **Develop a Project Plan**
    - **Plan for needed knowledge, skills, and abilities**
    - **Plan for project resources**
    - **Establish schedule and budget**
    - **Plan stakeholder involvement**
    - **Identify project risks**
    - **Plan for data management and interoperability (interfaces)**
    - **Document and manage the project plan**
  - **Obtain Commitment to Plan**
    - **Review the project plan with relevant stakeholders**
    - **Reconcile work and resource levels with budgeted resources**
    - **Obtain commitment from all stakeholders**

Integrated Master Plan (IMP)

- **Integrated Master Plan (IMP): An *event-driven* plan consisting of a hierarchy of program events – defines program Scope**
  - **Each event being supported by specific accomplishments, and each accomplishment associated with specific criteria to be satisfied for its completion.**
  - **The IMP is a narrative *lifecycle* plan explaining the overall management of the project.**
  - **Account for contractor and government events**
  - **Foundation for the project Integrated Master Sch[illegible] (IMS)**
  - **NO[illegible] to specific**

IMP Description



- **Identify events, necessary accomplishments, and criteria_**
- **<u>Event</u>-driven plan for executing a program**
- **<u>Not</u> a calendar-based product**

Work Breakdown Structure (WBS)

Work Breakdown Structure (WBS)

"The WBS defines the program in terms of hierarchically-related, product-oriented elements and may include generic activities that support product development (operations, overhead). It represents the entire program from the Government Program Manager's responsibility."

"…displays and defines the product, or products, to be developed and/or produced. It relates the elements of work to be accomplished to each other and to the end product. In other words, the WBS is an organized method to breakdown a product into sub-products at lower levels of detail."

"A product-oriented family tree composed of hardware, software, services, data, and facilities. The family tree results from program planning and systems engineering efforts during the acquisition of a defense materiel item."

Reference: Military Standard (MIL-STD) 881C, October 2011

Levels of the WBS

WBS Levels:

- **Level 1 is the entire system and/or program, project or subprogram (e.g., mission applications).**
- **Level 2 elements are the major elements subordinate to Level 1. These major elements are usually prime mission products, which include all hardware and software elements. Level 2 elements also include aggregations of system-level services (e.g., systems engineering, program management, etc.) and data.**
- **Level 3 elements are subordinate elements of each Level 2 major elements and include hardware, software, services (e.g., requirements management, configuration management, design/development, test and evaluation, etc.) and data.**
- **Level 4 elements represent a further definition (subordinate to Level 3) of the hardware, software, services, and data following the same process of breakdown described above.**

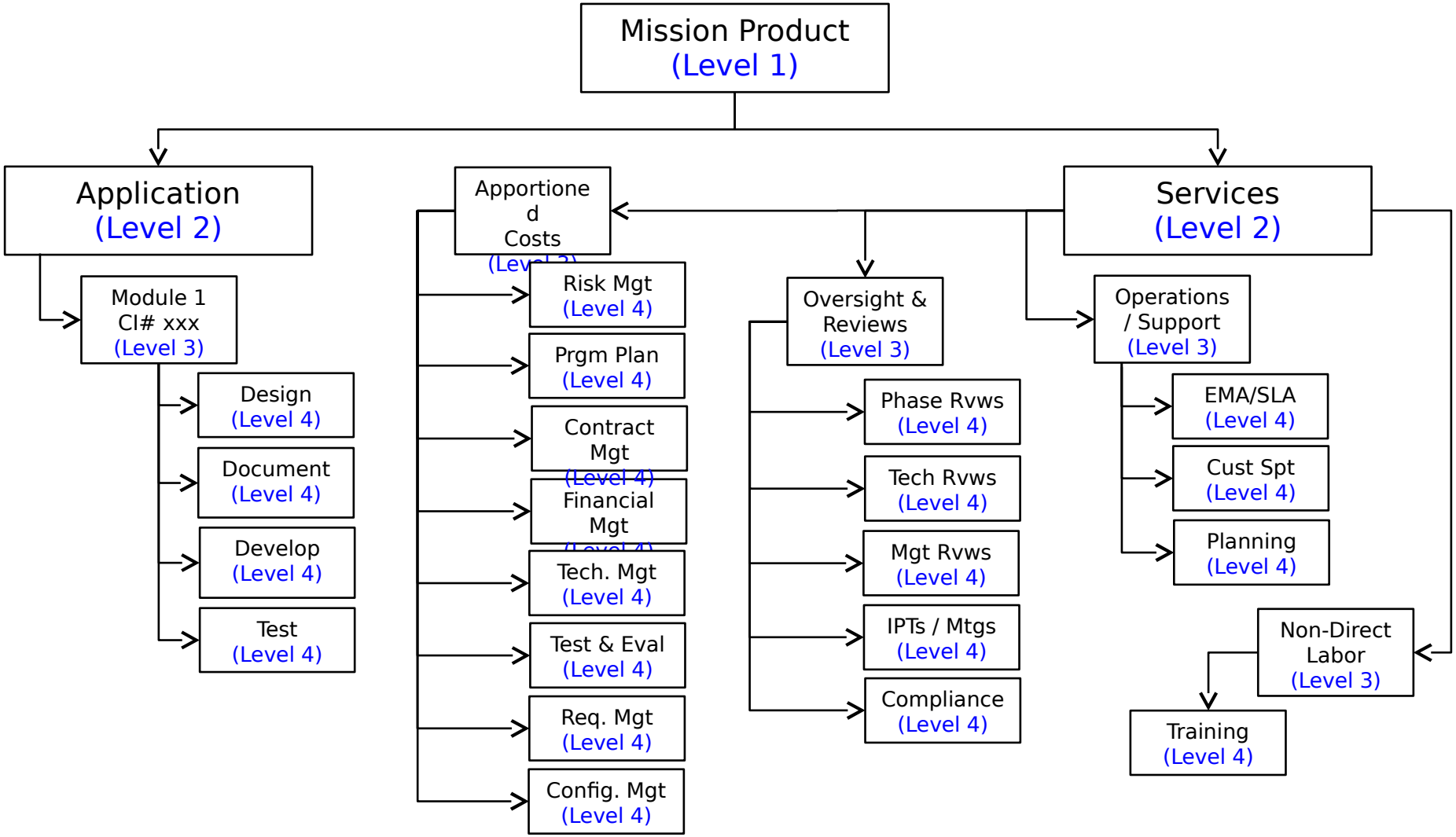
WBS Composition

WBS Composition:

- **Program WBS:** **The Program WBS encompasses an entire program, *including* the Contract WBS. It defines, at Level 4 (minimum), what is to be produced (with associated definitions). It contains *uniform terminology, definitions, and placement* in the product-oriented family tree structure. The Government Program/Project Manager is responsible for the Program WBS.**

- **Contract WBS:** **The Contract WBS is the agreed-to contract reporting level and includes any discretionary extensions to lower-levels for reporting. It defines these lower-level components as to what is to be produced and includes all the product elements (hardware, software, services, data or facilities). The Contract WBS should identify everything for which the contractor is responsible. The Contract WBS is prepared by the Prime contractor should also include all sub-contractor inputs.**

WBS Composition (Cont'd)



Sample WBS Hierarchy

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Level	Code	Description
1	1.0	Mission Product
2	**1.1**	**Hardware**
3	1.1.1	Development Environment
3	1.1.2	Test & Evaluation Environment
3	1.1.3	Production Environment
2	**1.2**	**Database**
3	1.2.1	Design
3	1.2.2	Document
4	1.2.2.1	Design Document
4	1.2.2.2	Database Specification
4	1.2.2.3	ER Diagram
4	1.2.2.4	Database Dictionary
3	1.2.3	Develop
4	1.2.3.1	Build
4	1.2.3.2	Integrate
2	**1.3**	**Application**
3	1.3.1	Module/CI #1
4	1.3.1.1	Design
4	1.3.1.2	Document
5	1.3.1.2.1	Requirements Specifications
5	1.3.1.2.2	Design Document
5	1.3.1.2.3	Test Scripting
5	1.3.1.2.4	Requirements Traceability Matrix
4	1.3.1.3	Develop
3	1.3.2	Module/CI #2
3	1.3.3	Module/CI #3
2	**1.4**	**Services**
3	1.4.1	Apportioned Costs
4	1.4.1.1	Requirements Management
4	1.4.1.2	Configuration Management
4	1.4.1.3	Risk Management
4	1.4.1.4	Program Management
4	1.4.1.5	Contract Management
4	1.4.1.6	Financial Management
4	1.4.1.7	Technical Management
4	1.4.1.8	Test & Evaluation Management
3	1.4.2	Oversight & Reviews
4	1.4.2.1	Phase Reviews
4	1.4.2.2	Technical Reviews
4	1.4.2.3	IPTs and Meetings
4	1.4.2.4	Management Reviews
4	1.4.2.5	Compliance Reviews
3	1.4.3	Operations & Support
4	1.4.3.1	EMA / SLA Development
4	1.4.3.2	Help Desk / Customer Support
4	1.4.3.3	Planning
3	1.4.4	Non-Direct Labor
4	1.4.4.1	Training

BES Organizational WBS

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Level	PROGRAM	WBS	Duration	Work
2	RELEASE	0000		
3	Apportioned Cost	MA00		
3	Oversight and Review Products	M000		
3	Contracting	Q000		
3	Logistics / Sustainment	L000		
3	Technical			
2	AIS SUPPORT (Direct Services/Customer Support)	M000		
3	AIS SPT/CUSTOMER SUPPORT	M600		
3	AIS SPT/FINANCIAL	MF00		
3	AIS SPT/SYSTEM ADMINISTRATION	MG00		
3	AIS SPT/CONTRACTING	MK00		
3	AIS SPT/PROGRAM MGT	MP00		
3	AIS SPT/TEST	MT00		
2	AIS TR			
3	AIS TN			
2	Non-La			
3	Technical			
4	*Concept of Operations (ConOps) and Peer Review Minutes*	*AD10*		
4	*System Subsystem Specifications (SSS) and Peer Review Minutes*	*AD20*		
4	*Software Requirements Specifications (SRS) and Peer Review Minutes*	*AD30*		
4	Minutes - Joint Application Design (JAD) Sessions	AD71		
4	Risk Management Plan (RMP) and Peer Review Minutes	AD76		
4	*Software Development File*	*AD80*		
4	*Software Development Plan (SDP) and Peer Review Minutes*	*AD50*		
4	Analysis of Alternatives (AoA)	ADR1		
4	Alternative System Review (ASR) & Minutes	ADR3		
4	Preliminary System Specifications and Peer Review Minutes	ADX1		
4	*Defense business system certification and approval (>$1M)*	*ADX3*		
4	*Database*	*CD00*		
4	*CI #N - Component*	C000		

Aligns with TWS products

53		General Requirements Specification (GRS)	GRS Template
54		Concept of Operations (ConOps)	ConOps Template
55		System Subsystem Specification (SSS)	SSS Template
56		Software Requirements Specification (SRS)	SRS Template
57		Updated RTM	RTM Template
58		Preliminary Design Document (DD)	DD Template
59		Preliminary Database Specification (DS)	DS Template

Product-based…activities support product development

Avoiding Common WBS Mistakes

- **Focus on products; remember, schedule activities support development of products**
- **Do not use organizational structure as the basis for your WBS**
- **Ensure Program WBS includes contractor-developed WBS elements (both prime and sub-contractors)**
- **Develop your WBS to meet your needs; number of levels is determined by products**
- **Be consistent with terminology; avoid using verbs**
- **A schedule is NOT a WBS**
- **Use MIL-STD-881C, Appendix K**

Preparing the IMS

- Review the project TWS, IMP and WBS
- Determine method for producing and managing the schedule
  - Best Practice: Microsoft Project
- Suggested Preparation Sequence:
  1. Define IMS initial parameters and resources
     - Start Date, Non-Working Days, Resource Pool
  2. Create Release and Phase Tasks
  3. Define Products, Events, and Accomplishments for each phase and establish sequence to meet criteria
  4. Define interdependencies between schedule entities
  5. Refine task durations
  6. Assign/allocate resources; coordinate schedule with stakeholders
  7. Baseline Schedule

IMS Structure

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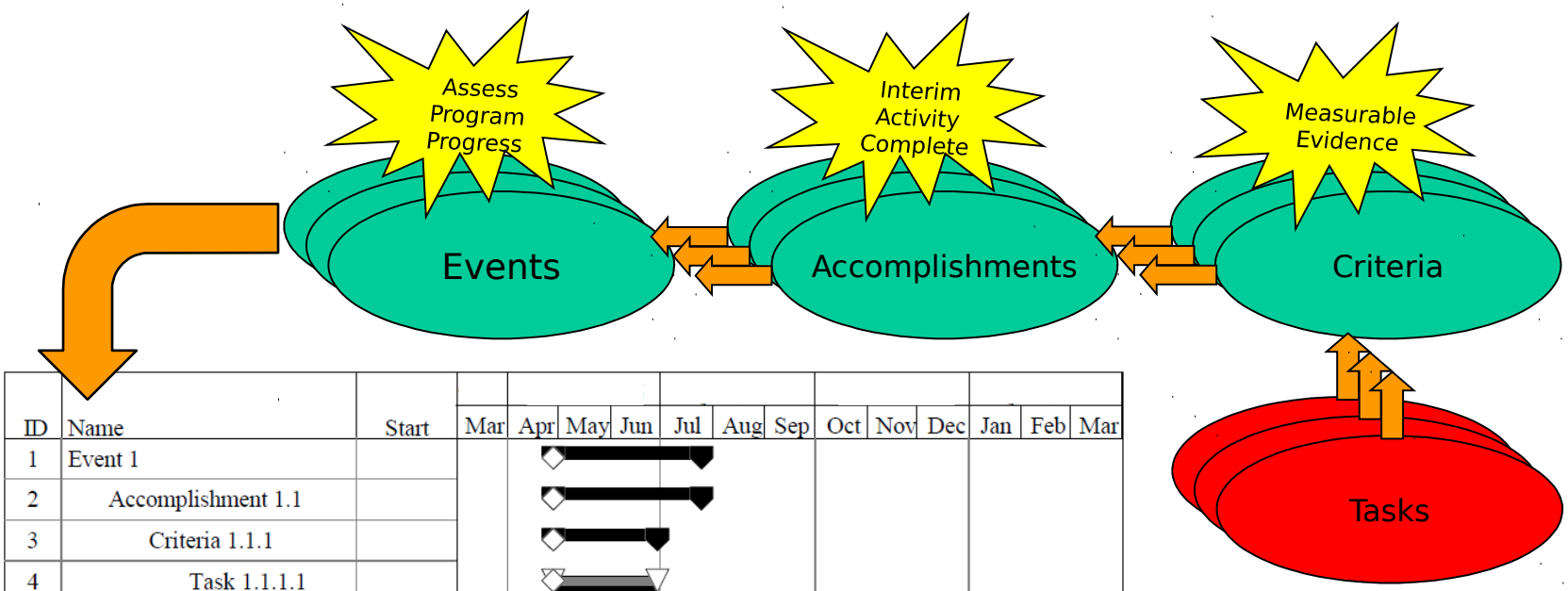

ID	Name	Start
1	Event 1	
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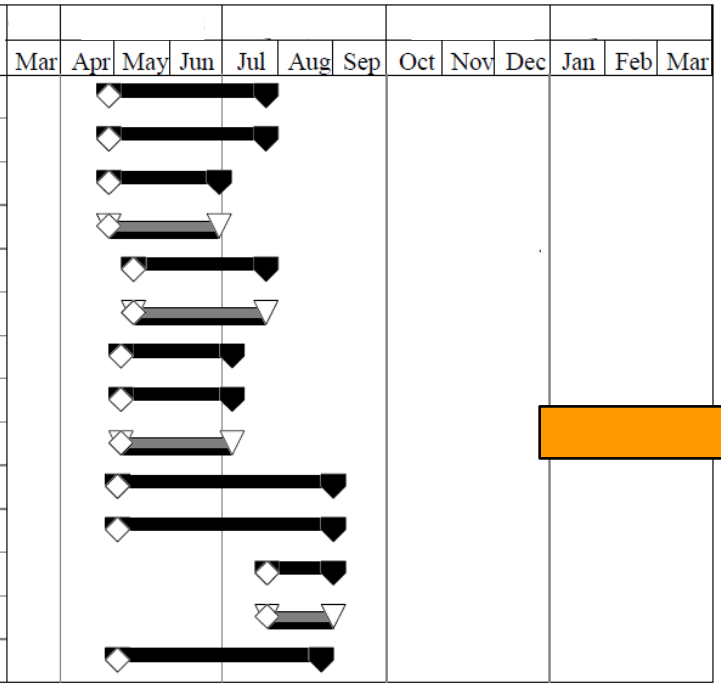
4	Task 1.1.1.1	
5	Criteria 1.1.2	
6	Task 1.1.2.1	
7	Accomplishment 1.2	
8	Criteria 1.2.1	
9	Task 1.2.1.1	
10	Event 2	
11	Accomplishment 2.1	
12	Criteria 2.1.1	
13	Task 2.1.1.1	
14	Criteria 2.1.2	



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IMS Quality Control

- Are all IMP Events/Accomplishments/Criteria, CLINs, Tasks & Deliverables included in the IMS?
- Does the IMS include contractor and government activities?
- Are interdependencies for tasks identified?
- Are task durations reasonable?
- Is the scheduled resource loaded? Have resources been “leveled”?
- Have all stakeholders reviewed/approved the IMS?
- Is the Critical Path logical?
- Can the IMS be managed to identify current status?
- Is the IMS under Baseline control? Are changes controlled via a disciplined change control process?

Critical Path and Slack

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CRITICAL PATH:

- Longest sequence of activities in a project plan which must be completed on time for the project to complete on due date.
  - An activity on the critical path cannot be started until its predecessor activity is complete
  - If the task is delayed for a day, the entire project will be delayed for a day unless the activity following the delayed activity is completed a day earlier.

SLACK:

- Slack is the amount of time a task can be delayed without impacting the start date of a subsequent task

Recommendation: Use a tool like Microsoft Project to compute the critical path and slack…

Schedule Compression

- **Know how to communicate critical path and slack to your team, organization leadership, and your customer**
  - **Fully understand the task dependencies and use your knowledge of your schedule to defend pressures to compress your schedule**
  - **Use caution when "padding" you schedule with slack or "management reserve"**

- **Anticipate schedule compression and potential risks**
  - **Fully understand the critical path of your schedule; be ready to defend no cuts or additions**
  - **Consider what tasks can be reduced or eliminated?**
  - **LAST RESORT: consider adding additional resources – very expensive and usually results in little or no benefit**

Schedule Refinement & Re-baseline

- **REFINEMENT: Occurs when the Project Manager makes changes to the planning packages and work packages and the following conditions hold:**
  - **The total cost of the project release does not change**
  - **The delivery date of any product / capability does not change**

- **RE-BASELINE: Occurs when the Project Manager makes changes to a schedule and the conditions associated with refinement do *not* hold.**
  - **The total cost of the project release changes**
  - **The delivery date of any product / capability changes**
  - **Division Leadership notification required**

BPD Reference: Schedule Re-baseline or Refinement Procedure (TOPR008)

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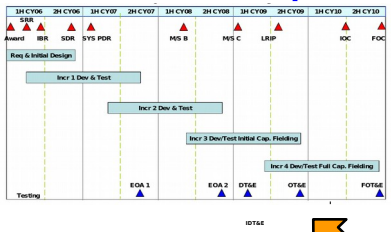
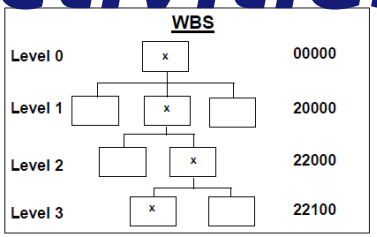
IMP/IMS Linkages to Program Activities

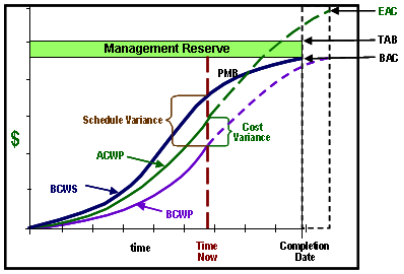
Government Roadmap



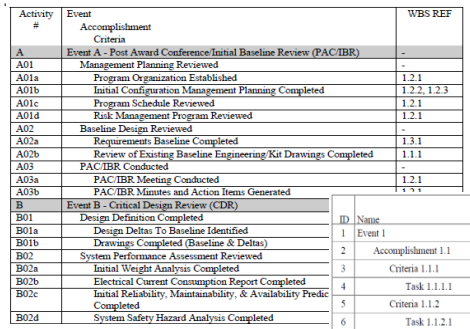
WBS



EVMS



IMP

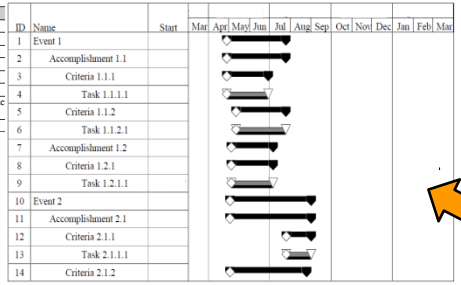


Activity #	Event Accomplishment Criteria	WBS REF
A	Event A - Post Award Conference/Initial Baseline Review (PAC/IBR)	-
A01	Management Planning Reviewed	-
A01a	Program Organization Established	1.2.1
A01b	Initial Configuration Management Planning Completed	1.2.2, 1.2.3
A01c	Program Schedule Reviewed	1.2.1
A01d	Risk Management Program Reviewed	1.2.1
A02	Baseline Design Reviewed	-
A02a	Requirements Baseline Completed	1.3.1
A02b	Review of Existing Baseline Engineering/Kit Drawings Completed	1.1.1
A03	PAC/IBR Conducted	-
A03a	PAC/IBR Meeting Conducted	1.2.1
A03b	PAC/IBR Minutes and Action Items Generated	1.2.1
B	Event B - Critical Design Review (CDR)	
B01	Design Definition Completed	
B01a	Design Deltas To Baseline Identified	
B01b	Drawings Completed (Baseline & Deltas)	
B02	System Performance Assessment Reviewed	
B02a	Initial Weight Analysis Completed	
B02b	Electrical Current Consumption Report Completed	
B02c	Initial Reliability, Maintainability, & Availability Predic Completed	
B02d	System Safety Hazard Analysis Completed	

IBR

SOW

IMS



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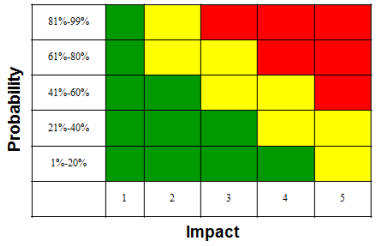
13	Task 2.1.1.1	
14	Criteria 2.1.2	

Risk Mgt



BPD

Requirements Development & Management

Requirements Development Process

Definition: A deliberate and structured approach to understand what you intend to build *before* you design the system

- **Intended to identify, define, document, and analyze customer, product, and product component requirements**
  - **Functional Requirements**
  - **Non-Functional Requirements (Technical / Product)**
- **Each requirement shall be elaborated to the point where:**
  - **The functional user recognizes the requirements as satisfying a specific, declared need**
  - **The designer /developer understands how to build and integrate the requirement into the system**
  - **The tester knows how it can be verified and validated (tested)**

BPD Requirements Development & Management

Functional Review Board (FRB)

- **The Functional Review Board (FRB) – chartered board made up of customers, user representatives, and the PMO**
  - **Primary responsibilities: identification, review, clarification, and prioritization of functional requirements for a system**
    - **This board is usually the source of requirements for a system**
    - **May be documented in a number of different ways (e.g., Excel Files, Change Requests, Word Documents, Deficiency Reports, IT/NSS Requirements Document, etc.)**
  - **Alternate responsibilities:**
    - **Recommend the content (e.g., requirements) and sequence of releases to the Configuration Control Board (CCB)**
    - **May be the body that determines acceptance criteria for a release**

Develop Customer Requirements Procedure

OPR: Functional/Requirements Analysts and Subject Matter Experts

- **Consists of identifying and elaborating stakeholder needs, expectations, constraints, interfaces, operational concepts and product concepts**
  - **Use the Procedure at any time during lifecycle when a new requirement is identified**
- **DEFINE your internal processes for documenting and managing requirements; implement a change management process**
  - **Automation should be a key focus area**
- **Communicate frequently with your Customer**

BPD Reference: Develop Customer Requirements Procedure (RDPR0

KNOW YOUR BUSINESS PROCESS & RULES!

Characteristics of a Good Requirement

- Understandable – we know what's needed
- Correct / Precise – it will do what's needed
- Unambiguous – everyone interprets it in the same way
- Complete – it can be fully documented
- Consistent – it is not contradictory with other requirements
- Interoperable – dependencies among requirements are known
- Verifiable / Valid – it can be tested
- Singular –it only appears once
- Traceable – it can be traced through design, test, and delivery
- Prioritized – relative importance is understood

Requirements Statements

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The Good:

- Use Imperatives – commands something be provided
  - Use “Shall”, “Must”, “Must Not”, “Required”
  - Avoid “Will”
- Use Directives – specific examples like “see the table below” and “See Figure 1 below” (illustrative information)

The Bad & Ugly:

- Eliminate weak phrases – causes uncertainty; avoid using terminology like “adequate”, “as applicable”, “as appropriate”, “be able to”, “be capable of”, etc.
- Do Not Use Continuances – open-ended statements like “such as the following” and “similar to that shown below”
- Limit Options – often presents too much latitude in the implementation of a requirement; e.g., “or”, “can”, “may” and “optionally”

Develop Product Requirements Procedure

OPR: Lead Engineer / Lead Developer / Software Engineer

- **Consists of deriving non-functional and technical requirements (product requirements) by analyzing customer requirements in technical detail**
  - **Hardware**
  - **Software**
  - **Architecture**
- **Includes identification of external interface requirements**
- **Create high-level prototype designs for all requirements**

KNOW YOUR PRODUCT!

BPD Reference: Develop Product Requirements Procedure (RDPR003)

Analyze and Validate Requirements Procedure

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OPR: Requirements Team / All Relevant Stakeholders

- **Performed to determine if combined customer and product requirements will satisfy stakeholder needs and constraints**
- **Consists of the following:**
  - **Analysis of interdependencies between the customer and product requirements**
  - **Verify characteristics of both customer and product requirements; define acceptance criteria**
  - **Refinement of operational concepts and scenarios**

BPD Reference: Analyze and Validate Requirements Procedure (R

KNOW HOW YOUR BUSINESS PROCESS & RULES WILL BE IMPLEMENTED / SATISFIED BY THE PRODUCT!

Configuration Control Board (CCB)

- **The Configuration Control Board (CCB) – chartered board made up of customers, user representatives, and other stakeholders**
  - **Primary responsibility: manage the overall configuration of a system through formal change management processes**
    - **This board is usually the source of requirements allocation to releases for a system; based on cost, schedule and performance estimates provided by the PMO – FUNCTIONAL BASELINE**
  - **Decisions made by the CCB are formally documented on the Configuration Control Directive (CCD) Form**
    - **Semi-formal signed agreement between the CCB and PMO on what to produce, when…**
    - **CRITICAL document that helps control requirements creep within a release**

Develop Contractual Requirements Procedure

OPR: Requirements Team / Contracting Representative

- **Performed to prepare appropriate requirements documentation to be included in solicitation packages, Requests for Proposals, or Service Level Agreements (SLAs)**
- **Consists of the following:**
  - **Develop contractual requirements documentation**
  - **Identify contract deliverables and acceptance criteria**

KNOW WHAT YOU EXPECT YOUR DEVELOPER TO DELIVER! (RDPR017)

Requirements Management

Definition: a structured process that establishes and maintains agreement between the customer and the project team on the state and status of requirements for a system

- **Requirements Management is the sum of all activities in connection with requirements that take place *after* requirements have been developed and recorded/documented**
- **Establishes continuous oversight of system requirements**
- **Provides the mechanism to change, add, or delete system requirements, as necessary**
- **Establishes a structured requirements traceability process**

BPD Reference: Requirements Management Procedure (RDPR005)

Training

BPD Requirements Development & Management

Requirements Management Procedure

OPR: Requirements Manager, Functional Analyst, Subject Matter Expert

- **Requirements Management consists of:**
  - **Documenting, managing and archiving requirements**
  - **Obtaining stakeholder commitment to documented requirements**
  - **Having clear understanding of requirements as they evolve**
  - **Placing requirements under configuration control**
  - **Instituting effective requirements change management**
    - **Keeping track of the history of each requirement**
    - **Maintaining version control of each requirement**
    - **Maintaining traceability of each requirement**

Requirements will change…but change is not the enemy – Unmanaged and uncontrolled change is!

Requirements Traceability

Requirements traceability refers to the ability to follow the life of a requirement from its origins, through its development and specification, to its subsequent deployment and use

Requirements traceability is used to capture the relationships between requirements, design, code, test, and implementation of a system

- **Traceability demonstrates:**
  - **Where requirements are satisfied by the design**
  - **Where design is satisfied by code**
  - **Where requirements are tested for functionally**
- **Traceability exposes:**
  - **Uncovered requirements**
  - **Uncovered design**
  - **Extraneous tests**

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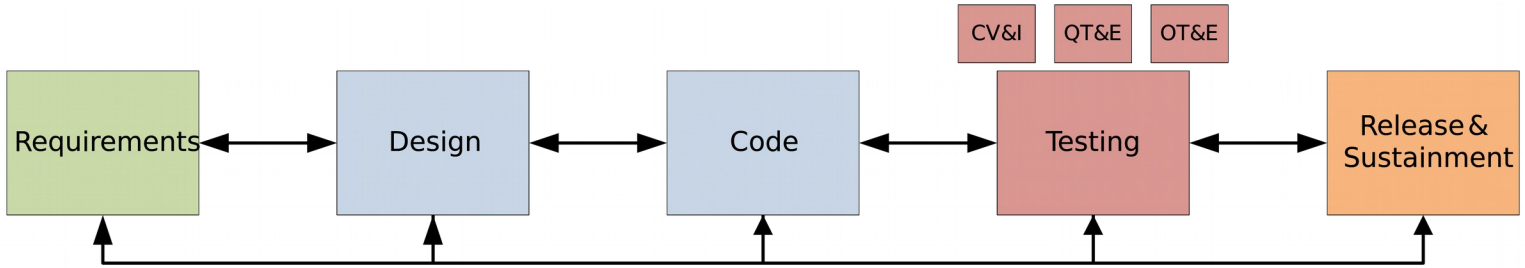
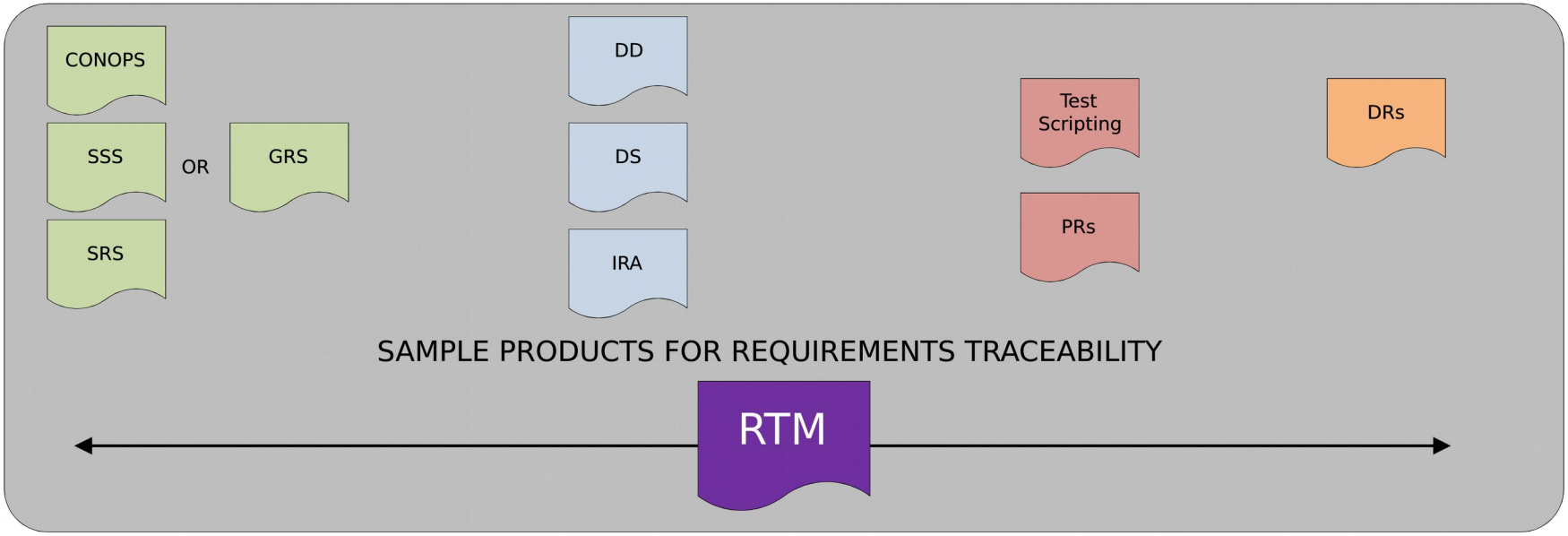
The Traceability Path





Requirements traceability is accomplished in both directions and across all activities!

Expectation Management

Expectation Management

- **Customer Expectation Management Agreement (EMA)**
  - **Jointly developed and formally documented agreement between the PM and the functional sponsor to proactively resolve or de-conflict potential issues to include cost, schedule and performance expectations of program**
- **Statements of Capability (SOC)**
  - **Jointly developed and formally documented agreement between the PM and the Lead Developmental Test and Evaluation Organization (LDTO) that describes the support provided by the LDTO in support of a program**
- **Service Level Agreements (SLA)**
  - **Jointly developed and formally documented agreement between the PM and any service provider that describes the support to be provided; may include evaluation criteria to quantify quality of support provided**

Project Monitoring & Control

What is Risk Management?

- **Risk Management is the <u>structured</u> act or practice of defining, handling, and controlling risks**

- **We have a recognized need to improve Risk Management**
  - **Reduced funding**
  - **Acquisition process streamlining**
  - **Rapid technological changes**
  - **Information assurance; threats to systems**

<u>Notable Quotes:</u>

“It’s something happening right now!”

“It’s something caused only by our contractor.”

“It’s a concept having nothing to do with program success.”

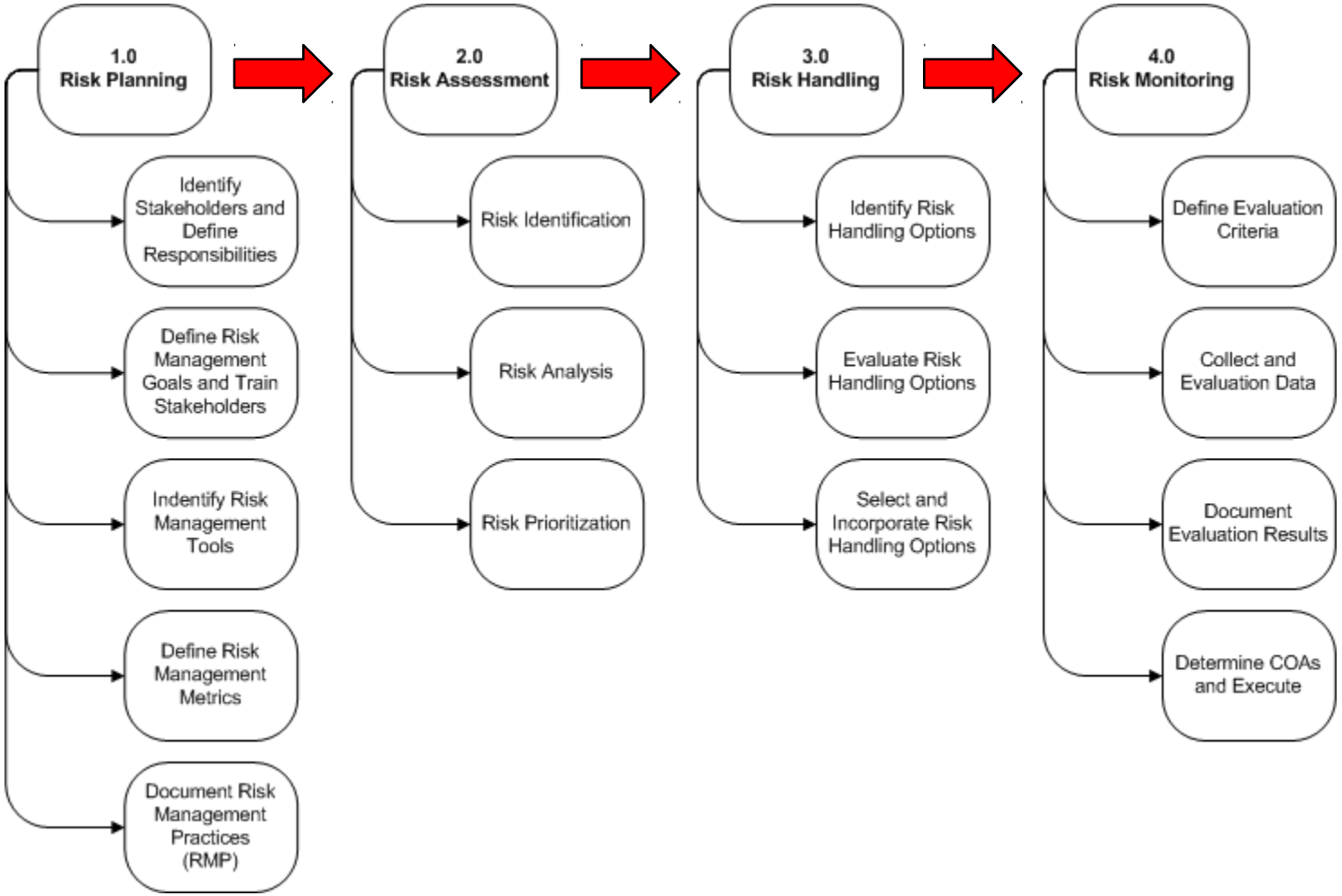
Risk Management

Metrics *(Past)*	Issues *(Today)*	Risk *(Future)*
Where we were…	Where we are…	Where we‘re going
“What happened?” “What was the impact?” Cost Schedule Performance “Can we help others avoid this in the future” Lessons Learned	“We have a problem…” The project ***is*** being directly impacted. Cost Schedule Performance “Stop the bleeding.” Tiger Teams Red Teams	“What could go wrong?” “The project has not been Impacted…yet!” Cost Schedule Performance “Plan for the worst.” Mitigation Plans Constant Monitoring

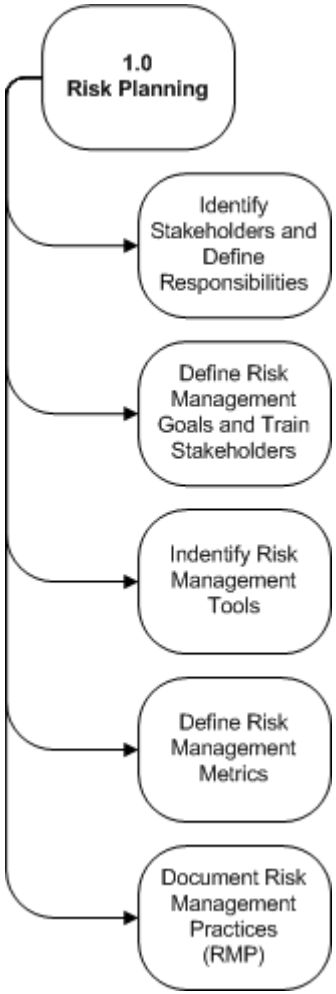
Risk Management Definitions

- A Risk is a measure of future uncertainties in achieving program goals and objectives within defined cost, schedule and performance constraints
- Risk reduction deals with lowering the probability of the event
- Risk exposure is the probability of the risk happening multiplied by the cost of expected loss if risk occurs
- Risk mitigation are actions taken to prevent risks from occurring
- Risks have three components:
  - A future (yet to happen) event that has potential consequence from occurring
  - A probability (or likelihood) the event will occur; involves uncertainty
  - The consequence (or effect) if the risk is realized (negative impact)

What is the Risk Management Process?



Risk Planning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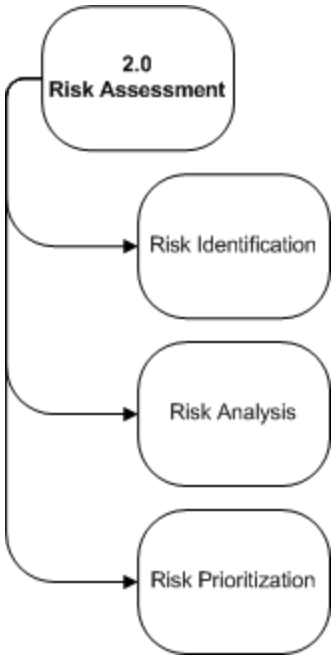
Risk Planning
Identify Stakeholders and Define Responsibilities
Define Risk Management Goals and Train Stakeholders
Indentify Risk Management Tools
Define Risk Management Metrics
Document Risk Management Practices (RMP)

- **Purpose:**
  - **Develop and document a risk management strategy**
  - **Determine how to execute the strategy**
  - **Plan for adequate resources**
- **Activities**
  - **Identify stakeholders and responsibilities**
  - **Define goals and expectations**
  - **Identify tools and metrics**
  - **Establish and Charter a Program Risk IPT / Risk Management Board (RMB)**
  - **Document the strategy in a Risk Management Plan (RMP)**

Risk Assessment



- **Purpose:**
  - **Transition uncertainty of risks into known mitigation activities**
- **Activities**
  - **Identify internal and external risks from all sources**
    - **“IF……, THEN……” statements**
    - **“So what?” drills, “Five Why” drills**
    - **Fishbone (Ishikawa) Diagrams**
    - **Others…?**
  - **Analyze risks to determine <u>estimated</u> likelihood (probability), impact (consequence), and establish a rating (high, medium, low)**
    - **Impact – try “So what?” drills**
  - **Prioritize risks <u>across the Program</u>; usually based on overall rating**

Risk Matrix & Criteria

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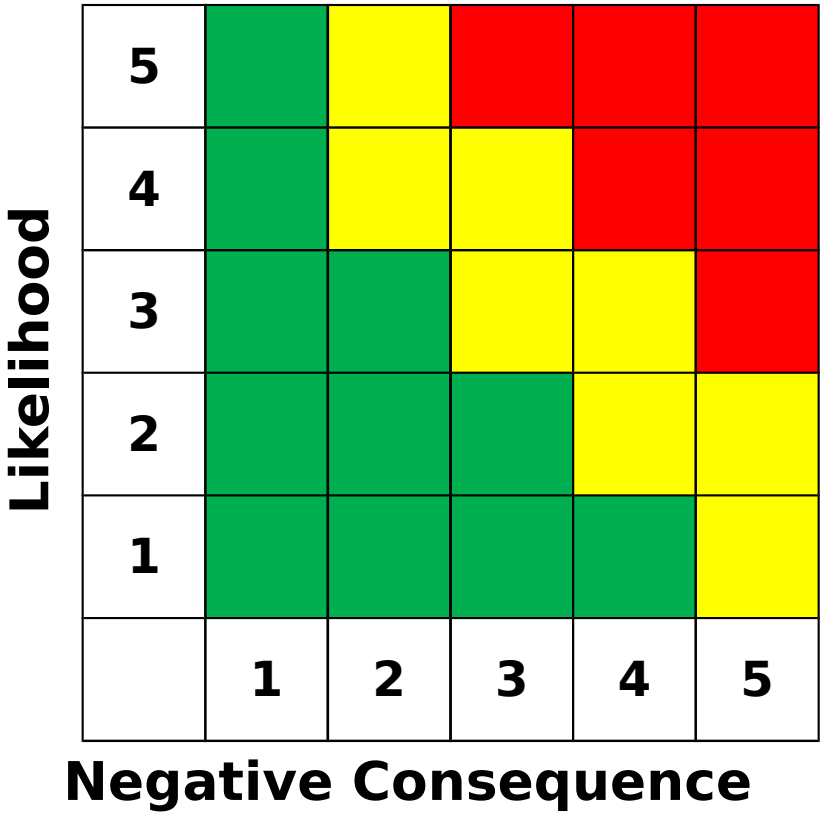
Likelihood

LEVEL	LIKELIHOOD	PROBABILITY OF OCCURRENCE
5	Near Certainty	81-99%
4	Highly Likely	61-80%
3	Likely	41-60%
2	Low Likelihood	21-40%
1	Not Likely	5-20%



Likelihood is a *SUBJECTIVE* interpretation of the probability that a risk will be realized.

Legend
- High Exposure
- Med Exposure
- Low Exposure

Risk Matrix & Criteria

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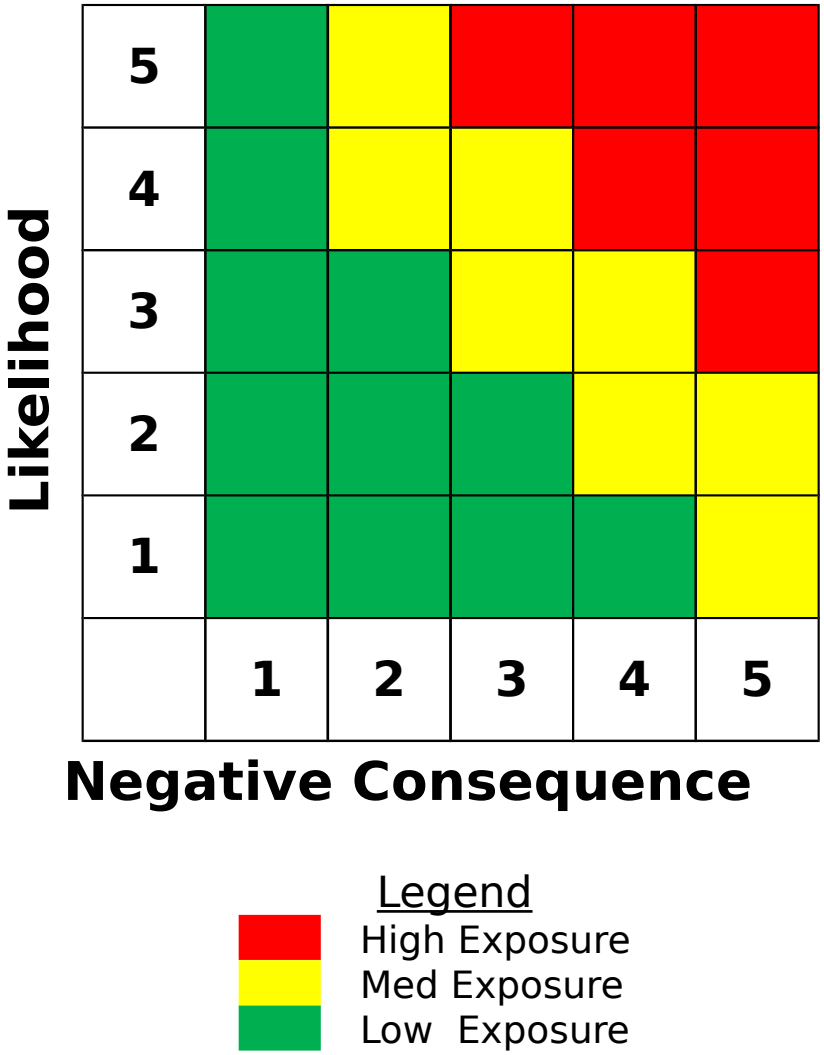
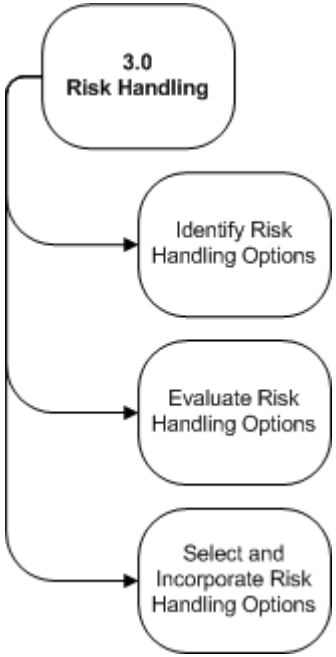
Consequenc

Severity	Level	Consequences
Critical	5	Cost increase **>10%**
		Schedule increase **>25%**
		Performance: Not executable
Serious	4	Cost increase between **7-10%**
		Schedule increase between **15-25%**
		Performance: Unlikely to execute
Moderate	3	Cost increase between **5-7%**
		Schedule increase **10-15%**
		Performance: Executable with issues
Minor	2	Cost increase of **<5%**
		Schedule increase **5-10%**
		Executable program
Negligible	1	No or minimal cost impact
		No or minimal schedule impact
		Executable program

Cor tion of the effect, result, or outcome (impact) if a risk is realized.



Risk Handling

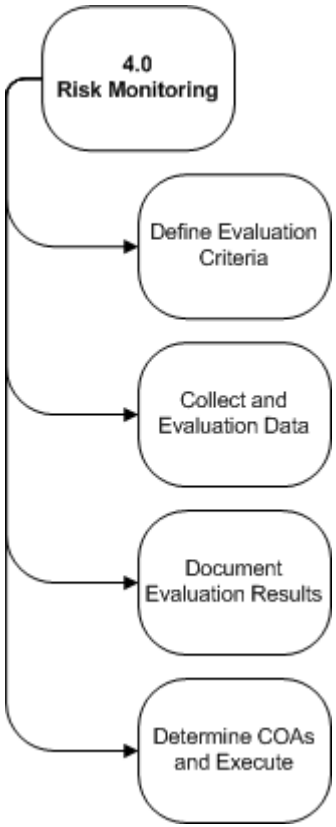


- **Purpose:**
  - **Determine an acceptable level of risk using mitigation techniques**
- **Activities**
  - **Identify appropriate risk handling options**
    - **Categories include: Avoidance, Control, Transfer, and Assumption**
  - **Evaluate risk handling options**
    - **Assess and evaluate feasibility, effectiveness, cost, schedule, and performance**
  - **Select appropriate handling option for each risk**

Risk Handling (Cont'd)

- **Handling Options:**
  - **Avoidance – replace High/Medium risks with Low risk solutions**
    - **Change concepts, requirements, practices**
    - **Usually involves cost/benefit analysis (trades)**
  - **Control – active risk management**
    - **Objective is to reduce probability or consequence – or both**
    - **Does not eliminate the sources of risk**
    - **Examples include robust design, prototypes/demos, modeling and simulation, inspections/walk-thrus, etc.**
  - **Transfer – reallocate risk to another stakeholder**
    - **Risk is not eliminated, but may have less impact**
  - **Assume – some risk is *ALWAYS* present**
    - **Conscious decision to accept the risk; PM is responsible**
    - **Usually only done for Low risks; Medium and High risks may require leadership involvement**

Risk Monitoring



- **Purpose:**
  - **Systematic process for evaluating success of risk handling activities**
- **Activities**
  - **Define evaluation criteria**
    - **Measures include cost, schedule, and performance**
  - **Collect and evaluate data**
    - **Look for trends, variances, anomalies**
  - **Elevate! Recommend action to management**
  - **Assess, Decide, Execute, Evaluate**
    - **Options may include: (1) revise risk handling; (2) invoke contingency plans; (3) rebaseline; (4) retire the risk**

Potential Sources of Risk

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Technical / Performance

- Product Maturity
- Customer / User Uncertainty
- Requirements Stability
- Complexity / Dependency
- Design Errors, Omissions
- Processes (Acq, Tech, Dev)
- Operational Performance

Schedule

- Unrealistic Requirements
- Capabilities Optimism
- Type (Time vs. Event Based)
- Incomplete ID of Tasks

Infrastructure

- Obsolete hardware
- Licensing

Personnel / Manpower Resources

- Skills (Organic and Vendor)
- Lack of Resources
- Vendor Stability

Physical Damage / Disaster

- Terrorism / Criminal
- Climate / Environment

Cost

- Uncertain Estimates / Funding
- Competitive Environment
- Design / Configuration Changes
- Data Ownership / Rights
- Contracting

WHAT ELSE?

Project Oversight Reviews & Reporting

- **Typical Reporting Systems:**
  - **SMART**
  - **CCARS**
  - **EITDR**
  - **EMASS**
  - **CPARs**
  - **Workflow (Suspense)**

Contact AFLCMC/HIP (Portfolio Management) for additional information…

- **Program / Project Reviews**
  - **BES Directorate Program Management Reviews (PMRs)**
  - **Program Sufficiency Review (PSR)**
  - **Technical Management Reviews (TMRs)**
  - **Milestone Reviews / End-of-Phase Reviews**
  - **Customer Reviews**
  - **Financial Reviews**

Technical Reviews

- **Initial Technical Review (ITR)**
  - Ensures the technical approach supports valid cost estimates and POM submissions
- **Alternative Systems Review (ASR)**
  - Assesses alterative systems that have been evaluated during COAs and AoAs
- **System Requirements Review (SRR)**
  - Ensures all requirements are consistent with cost, risks, constraints, and the preferred solution
- **System Functional Review (SFR)**
  - Ensures functional requirements are specified at a level low enough to proceed into preliminary design
- **Preliminary Design Review (PDR)**
  - Assesses preliminary design to obtain early feedback from appropriate stakeholders; authorizes movement of the project into detailed design

Technical Reviews (Cont'd)

- **Critical Design Review (CDR)**
  - Assesses the final product design and ensures appropriate design documentation is completed; authorizes the project to move into construction and/or configuration
- **Engineering Go/No-Go Recommendations**
  - Evaluates application of systems engineering disciplines at key points within the lifecycle of a project (primarily End-of-Phase Reviews and Milestones)
- **Test Readiness Reviews (TRR)**
  - Ensures the Component Validation and Integration (CV&I) portion of Developmental Test and Evaluation (DT&E) is completed; confirms the product is ready to begin the formal Qualification Test and Evaluation phase of DT&E
- **In-Service Review (ISR)**
  - Assesses the in-service technical health of an operational system from a risk, readiness, and customer satisfaction perspective; includes resolution of deficiencies and future release planning

Measurements & Analysis (Metrics)

- Use actual data (facts) to support the decision-making process
- Focus on leading indicators not lagging data; facts/trends should help predict future performance and drive adjustments
- Metrics must be easy to gather, maintain, interpret, and report; determine how you'll use the data before just collecting it…
- Optimize resource allocation based on performance analysis
- Some suggested project metrics (not all inclusive):
  - Cost and Schedule Variance or Schedule Hit/Miss Percentage
  - Requirements Change / Change Request Costs
  - Deficiency Reports vs. Rework Costs
  - Risk Mitigation Effectiveness
  - Test Script Execution vs. Planned (1st Pass Success)
  - Staff Stability

Quality Control and Quality Assurance

What are Peer Reviews?

- **Peer Reviews are in-depth analyses of a work product by a group of peers to identify defects as early as possible in the development life cycle**
  - **Performed incrementally as work products are being developed**
  - **Peer Reviews are structured but they are <u>not</u> management reviews**
  - **Each work product will be in one of three *states*—draft (40-60% complete), near final, or final**
  - **There are two *types* of Peer Reviews--coordination and meeting**
  - **There two *categories* of Peer Reviews--initial and follow-up**
- **Why conduct peer reviews?**
  - **Identify errors, problems and defects early**
  - **Improve product quality**
  - **Foster team involvement and ownership**

What Should be Peer Reviewed?

- At ***least ONE*** Peer Review should be completed on ***each*** work product identified on the project's BPD Tailoring Worksheet (minor work products)
- Some work products require at ***least TWO*** peer reviews (major work products):
  - Project Plans (TWP, RMP, CMP, etc.)
  - Requirements Documents (GRS / CONOPS, SRS, SSS)
  - Interface Requirements Agreement (IRA)
  - Database Specification (DS)
  - Design Document (DD)
  - Software Units
  - User Manual (UM), Operator Manual (OM)

Conducting Peer Reviews

- **Document product peer reviews; most products have a specific peer review checklist available on the BPD web site that guides reviewers though content/quality evaluation**
  - **Use the Generic Peer Review checklist if a specific product checklist is not available**
- **Track recommended change and action items identified through peer reviews to completion**
- **Place products developed during peer reviews under configuration management**

BPD Reference: Peer Review Procedure (RVPR003)

Test & Evaluation

- **The purpose of DT&E is to find and fix deficiencies, problems, or erroneous code at the earliest possible time in the lifecycle of a program or project**

- **DT&E supports this purpose by integrating its 3 component integrated phases:**
  - **(1) Initial Integrated Test Design (IITD)**
  - **(2) Component Validation and Integration (CV&I)**
  - **(3) Qualification Test and Evaluation (QT&E)**

- **DT&E evaluates the design, quality, performance, functionality, security, interoperability, supportability, usability and maturity of a system or capability in an operationally relevant environment**

Basic Forms of Testing

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Verification:

Peers, System Engineers, and Developers

- **Evaluation of a system or component to determine whether or not they meet documented requirements**
- **Did we build the product "right"?**
- **Includes human and computer testing**

Validation:

Test Organization, Users

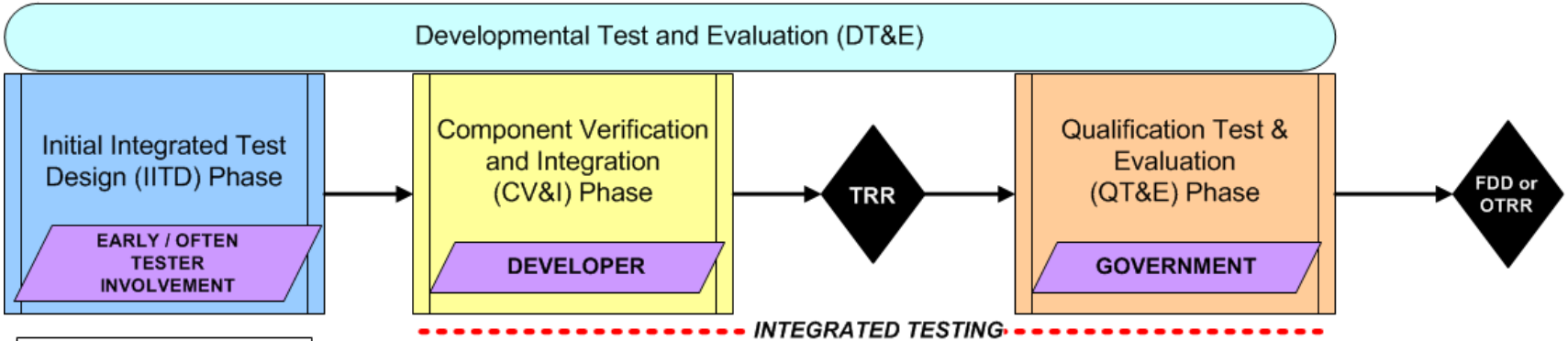
- **Evaluation of a system or component in its intended environment to determine whether it performs its intended functions**
- **Demonstrates suitability & effectiveness of the System**
- **Did we build the "right" product?**
- **Execution of System**

t everything is testable. Other forms of verification and validation incl
ection, peer reviews, auditing, data sampling, interview, etc.

DT&E Overview

Developmental Test & Evaluation (DT&E) Process Overview

Version 8.1



ITT Established/Chartered
TIPTs Formed
Requirements Analysis
Test Planning
Test Documentation

CV&I

Performed by the developing agency with government participation

Demonstrates that individual components and assembled components are developed IAW approved designs and function properly to meet documented requirements. CV&I includes the following test segments:

- Individual Component Verification (ICV)
- Component Integration Test (CIT)
- Data Management Evaluation (DME)
- Requirements Operability Test (ROT)
- Performance Evaluation Test (PET)
- Cybersecurity Evaluation (CSE)
- Regression Test (RT)
- System Integration Test (SIT)
- User Evaluation Test (UET)

QT&E

Performed by the Lead Developmental Test & Evaluation Organization (LDTO)

Validates the product integrates into the intended environment, meets documented functional, non-functional, and cybersecurity assurance requirements and performance standards. QT&E includes the following test segments:

- System Integration Test (SIT)
- Data Management Evaluation (DME)
- System Operability Evaluation (SOE)
- Performance Evaluation Test (PET)
- Cybersecurity Evaluation (CSE)
- Regression Test (RT)
- User Evaluation Test (UET)

Demonstrating Program Effectiveness

- How do you know when you are done?
- Testing cannot show the absence of defects, it can only show that software errors are present
- Complete testing is impossible for several reasons:
  - We can't test the following:
    - All the inputs to the program
    - All the combinations of inputs to the program
    - All the paths throughout the program
    - For all of the other potential failures, such as those caused by user interface design errors or incomplete requirements analyses

Testing Principles

- Tests must be traceable to documented requirements
- Tests should be thoroughly planned before testing begins
- Pareto Principle applies to software testing (20% of problems cause 80% of rework cost)
- Exhaustive testing is not possible
- Regression testing is performed, as appropriate, at each test level (regardless of whenever the software is being tested or if its environment changes)
  - Break-fix regression testing
  - System regression testing
- To be most effective, testing should be conducted as a collaborative effort across the PMO, LDTO and Development Team

Test Documentation

- **Integrated Test Team (ITT) Charter – establishes the cross-functional team charged with all aspects of T&E planning and execution**
- **Integrated Test Plan (ITP) – establishes scope of IDT&E activities and integrates both developer & government test approaches/activities into a single overarching plan covering all IDT&E events**
- **Integrated Test Description (ITD) – establishes the scope of IDT&E activities of the program to a SPECIFIC release**
- **Test scenarios, case, and scripts guide T&E activities by defining step-by-step instructions to effectively evaluate the requirements of a release**
  - **RECOMMENDATION: Use tools like HP ALM and Quick Test Pro to automate test execution**

Test Documentation (Cont'd)

- **Watch Items/Problem Reports – anomalies or deficiencies encountered during IDT&E segment test activities**
  - **RECOMMENDATION: Use HP ALM to manage Watch Items and Problem Reports**

- **Integrated Test Report (ITR) – documents the official results of IDT&E; should be a comprehensive report covering all phases and segments of test and evaluation**

BPD Integrated Test and Evaluation

Configuration Management QC/QA

- **Configuration Status Accounting**
  - **Involves the recording and reporting of information needed to effectively manage established baselines and those being established during the development process. This process helps to maintain configuration integrity during change control and development periods by ensuring that the status accounting records, documents, and executable system files are consistent**
- **Configuration Baselines**
  - **Functional Baseline (FBL) – established when the Configuration Control Board (CCB) approves the proposed capabilities (functional requirements) to be included a release**
  - **Allocated Baseline (ABL) – established when the Preliminary Design Review (PDR) is complete; indicates functional requirements are allocated within the system design**
  - **Product Baseline (PBL) – established immediately preceding the Test Readiness Review (TRR); includes all components of the prime mission product**

Configuration Management QC/QA

- **Configuration Management Audits**
  - **Functional Configuration Audit (FCA) – audits Configuration Item (CI) performance against its approved configuration documentation to verify the customer's functional requirements**

BPD Procedure: Functional Configuration Audit Procedure (CMPR006)

  - **Physical Configuration Audit (PCA) – audits Configuration Items (CIs) in the production software (Product Baseline) against the CM Library to ensure the correct version was released to the production environment**

BPD Procedure: Physical Configuration Audit Procedure (CMPR013)

AF Systems Engineering Assessment Model (SEAM)

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- **Overview**
  - **Single AF-wide *process improvement tool* used for the assessment and improvement of systems engineering processes in a project or across an organization**
  - **Composite of industry and DoD best practices**
  - **Promotes consistent understanding/application of SE**
  - **Facilitates a gap analysis of an organization's SE processes**

- **History**
  - **Baseline released (August 2008) – Version 1.0**
  - **Became policy with AFMCI 63-1201 (October 2009)**
  - **Update released (BPDtember 2010) – Version 2.0**

AF Systems Engineering Assessment Model (SEAM)

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- **The primary methodology for PPQA within the BES Directorate is the AF Systems Engineering Assessment Model (AF SEAM)**
- **AF SEAM was derived from various Capability Maturity Model Integration® (CMMI®) products**
  - **Also includes various international and industry standards, Department of Defense (DoD) publications and subject expert knowledge**
- **Goal: To promote the application and use of standard Systems Engineering (SE) processes across the AF and to improve the performance of these processes through Continuous Process Improvement (CPI)**

> ***"If you can't describe what you are doing as a process, you don't know what you are doing."***
>
> *W. Edwards Deming*

AF SEAM (Cont'd)

- **Why we need AF SEAM Assessments:**
  - **Lack of Systems Engineering (SE) discipline has been a major contributor to poor program performance**
  - **Many program problems have surfaced repeatedly**
    - **Missed or poorly validated requirements**
    - **Poor planning fundamentals; lack of risk management**
    - **Lack of rigorous processes**
  - **Foundation for Continuous Process Improvement (CPI)**
- **Mandated by AFMCI 63-1201 – *Implementing OSS&E and Life Cycle Systems Engineering***
  - **ALL programs will complete AF SEAM Self-Assessment *annually***

AF SEAM (Cont'd)

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- **Intent:**
  - **Ensure consistent understanding of SE practices, ensure processes are in-place and program teams can execute them**
  - **Document repeatable SE "best practices" across AF; find opportunities for continuous improvement**
  - **Improve program performance and reduce program technical risk**
- **Two types of assessments:**
  - **Program Self-Assessments (annual requirement for all programs)**
  - **Independent Validation Assessments (when directed)**

10 Process Areas (PAs)

- Configuration Mgmt (CM)
- Decision Analysis (DA)
- Design (D)
- Manufacturing (M)
- Project Planning (PP)
- Requirements (R)
- Risk Mgmt (RM)
- Sustainment (S)
- Tech Mgmt & Ctrl (TMC)
- Verification &Validation (V)

Training

BPD AF SEAM Self-Assessments

AF SEAM Goals

- **Ensure a consistent understanding of systems engineering**
- **Ensure core SE processes are in place and being practiced at the *program/project* level**
- **Document repeatable SE "Best Practices" across AF**
- **Identify opportunities for continuous Improvement**
- **Clarify roles and responsibilities**
- **Improve program performance & reduce risk**

- **AF SEAM is NOT an appraisal of product quality**
- **AF SEAM is NOT a report card on personnel or the**

Policy

- **AFMCI 63-1201, *Implementing OSS&E and Life Cycle Systems Engineering*, Change 2 (11 February 2011)**
  - *"Programs listed in the Air Force Systems Information Library (AFSIL) shall use AF SEAM as a self assessment tool to evaluate the organization's capability to perform SE processes. AF SEAM assessments shall be conducted annually." (Para 1.6)*
  - *"Organizations are encouraged to assess their programs managed under common processes within a single assessment. The assessment of common programs shall be at the organizational Division level or lower." (Para 1.6)*
- **AF PEO BES Policy:**
  - *ALL programs required to build a BPD Tailoring Worksheet (TWS) shall complete an AF SEAM Self-Assessment annually*
    - *FoS / SoS: If consolidated under a single TWS, perform a single AF SEAM Self-Assessment*

AF SEAM Pedigree

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- **AF SEAM Foundation:**
  - **Capability Maturity Model Integration (CMMI®)**
  - **Defense Acquisition Guidebook (DAG)**
  - **AFI 63-1201 – *Life Cycle Systems Engineering***
  - **ANSI/EIA 632 – *Processes for Engineering a System***
  - **IEEE/EIA 731 – *Systems Engineering Capability Model***
  - **ISO/IEEE 15288 – *Systems Engineering-System Life Cycle Processes***
  - **INCOSE – *System Engineering Standards***

AF SEAM Practices

- **Specific Practices**
  - Unique to each process area
  - Informative Material
    - Description
    - Typical Work Products
    - Other Considerations
    - References
    - Local References

- **Generic Practices**
  - Same questions apply to all process areas
  - Informative Material
    - Description
    - Typical Work Products
  - Facilitates successful achievement of specific practices and process area goals

AF SEAM Practice Composition

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Process Areas	Goals	Specific Practices	Generic Practices	Total Practices
Configuration Management (CM)	3	8	7	15
Decision Analysis (DA)	1	5	7	12
Design (D)	3	14	7	21
Manufacturing (M)	4	12	7	19
Project Planning (PP)	3	15	7	22
Requirements (R)	4	13	7	20
Risk Management (RM)	3	7	7	14
Transition, Fielding & Sustainment (TFS)	4	15	7	22
Tech Mgmt & Control (TMC)	4	15	7	22
V & V (V)	5	16	7	23
IA SE Integration (IA)	4	10	7	17
Totals:	*38*	*130*	*77*	*207*

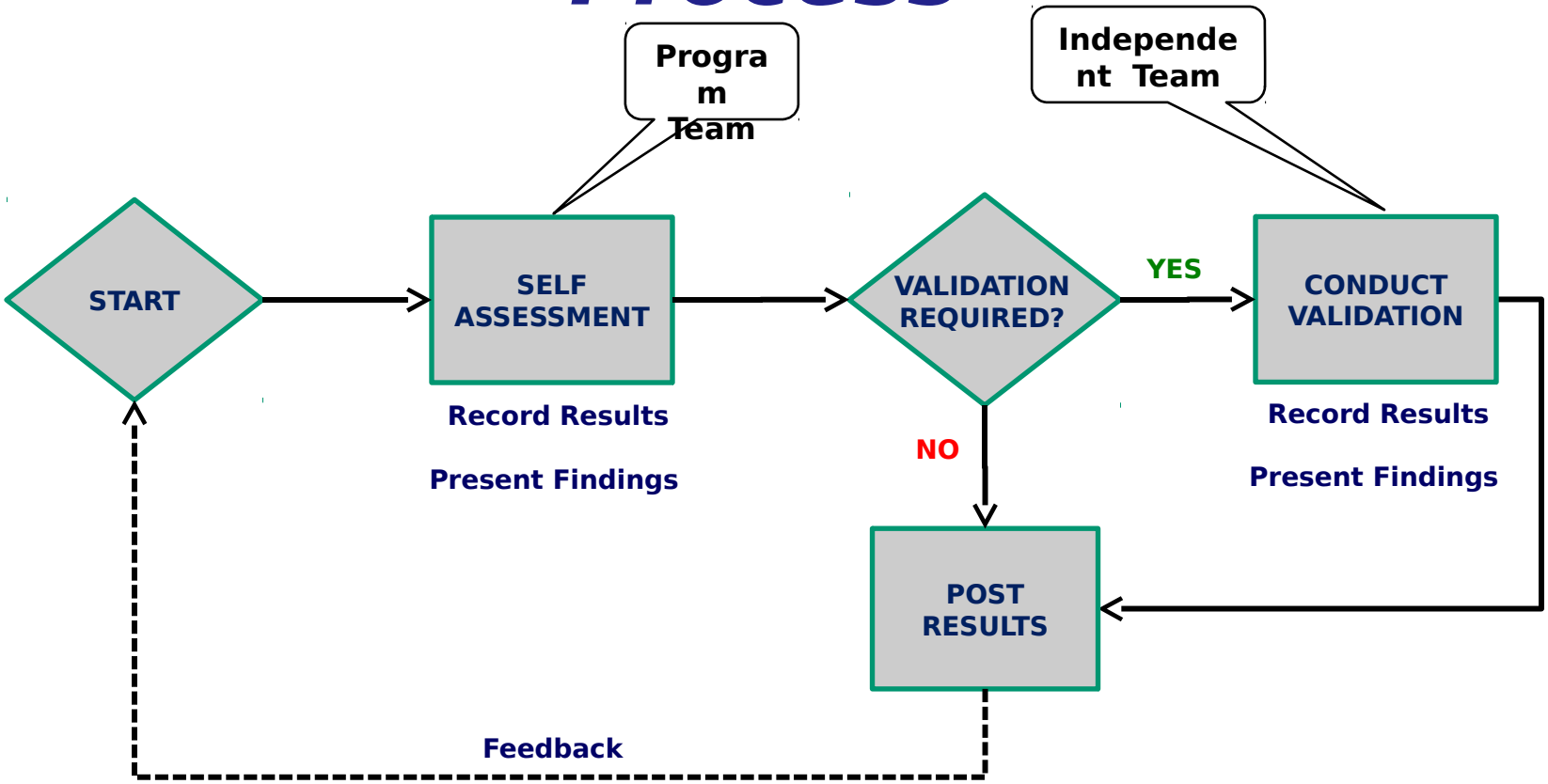
Sample Specific Practice

- **RMG1P1: Determine risk sources and categories**
- **Description: Establish categories of risks and risk sources for the project initially and refine the risk structure over time (e.g., schedule, cost, supplier execution, technology readiness, manufacturing readiness, product safety, and issues outside control of team), using Integrated Product Teams. Quantify the risk probability and consequence in terms of cost and schedule.**
- **Typical Work Products: Risk Management Plan; Risk Matrix**
- **Reference Material: DoD Risk Management Guide, AFI 90-901**
- **Other Considerations: Consider using Acquisition Center of Excellence Risk Management Workshops when needed. For manufacturing risks consider the**

Generic Practices

- **GP-1: Establish and maintain the description of a defined process**
- **GP-2: Establish and maintain plans for performing the process**
- **GP-3: Provide adequate resources for performing the process, developing the work products, and providing the services of the process**
- **GP-4: Assign responsibility and authority for performing the process, developing the work products, and providing the services of the process**
- **GP-5: Train the people performing or supporting the processes needed**
- **GP-6: Monitor and control the process**
- **GP-7: Review the activities, status, and results of the process with higher level management and resolve issues**

AF SEAM Assessment Process



Scoring Methodology

- **Compare your process (how you do things) to the practice (a process standard, or what should be done) and answer…**
  - **(1) = YES – if your process completely satisfies the practice**
  - **(0) = NO – if your process does not satisfy or partially satisfies the practice (Give yourself partial credit in the explanation.)**
  - **N/A – if the practice does not apply either by uniqueness of the program, timing, or other circumstances**
  - **Be prepared to defend N/A answers**

Answering Questions…

- **Make honest assessments of each practice**
  - **Use your TWS to help score and answer practice area questions**
- **Do not simply score questions YES / NO / N/A without detailed responses to each question**
  - **Provide concise explanations of how you meet the practice, don't meet the practice, or why the practice does not apply**
  - **Providing explanations helps formulate strengths and opportunities to improve process; data will be used in the final report**
  - **RECOMMENDED ACTION: restate the question as part of your response**
- **Only score YES if you fully comply with the practice**
  - **If you partially meet the practice but have an opportunity to improve, score as NO and explain your improvement/get-well plan**

Post Implementation Activities

After Release… Product Support

- **Implement Help Desk Operations**
  - **Ensure tiered support is defined (Tiers 1 – 3)**
  - **Many programs use the Field Assistance Service (FAS)**
- **Monitor health of the operational system**
- **Execute Life Cycle Management Plan (LCMP) / Life Cycle Sustainment Plan (LCSP)**
  - **Conduct In-Service Reviews / Customer Questionnaires**
  - **Estimate operational system support needs and customer desires**
  - **Use metric data to inform product support activities (C/S/P)**
  - **Implement Modification / Maintenance / Product Support Concepts**
    - **Correction – Fixing Deficiency Reports (DRs)**
    - **Adaptation – Accommodating changes to the environment**
    - **Enhancement – Extending Requirements**
    - **New Capability – New functionality within the system**

I Capability – S functionality – E within the system

Deficiency Reports

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- **Deficiencies can be identified by anyone (e.g., users, the program office, or system support agencies)**
- **Deficiencies are categorized by priority**
  - **Priority 1: Prevents accomplishment of essential capability; no work-around process exists; jeopardizes safety, security, or a critical capability. Target Repair Time Limit: 48 hours**
  - **Priority 2: Adversely affects accomplishment of essential capability; no work-around process exists; jeopardizes cost, competency, or significantly increased technical risk. Target Repair Time: 45 days or next planned release**
  - **Priority 3: Adversely effects accomplishment of essential capability, but a work-around process exists; jeopardizes cost, competency, or increases technical risk. Target Repair Time: 120 days or next available release**
  - **Priority 4: Results in user/operator annoyance or inconvenience, but a work-around process exists. Target Repair Time: 180 days or next available release**
  - **Priority 5: Any other defect. Target Repair Time: 180 days or next available release**

Summary

- **Training Objectives:**
  - **Define Program and Project Management**
  - **Review Key Elements of the BPD**
  - **Describe Key Project Management Functions**
  - **Describe Common Post Implementation Actions**

Feedback

- **Do you have any unanswered questions?**
- **Did we meet the objectives as stated?**
- **CLP credit should be automatic; verify in your records**
- **Please fill out a critique so we can improve this class for those who may attend in the future; written suggestions are very helpful**